ASSESSMENT OF POTENTIAL COAL-LIQUID MIXTURE FUEL UTILIZATION IN CANADA - PHASE I

MONTREAL ENGINEERING
COMPANY LIMITED

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FINAL REPORT

BY

MONTREAL ENGINEERING COMPANY, LIMITED

Work on this project was conducted under the auspices of the Canada Centre for Mineral and Energy Technology, Energy, Mines and Resources, Canada.

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April 1982

CANMET, Energy Research Laboratories
Energy, Mines and Resources Canada
555 Booth Street
Ottawa, Ontario
K1A 0G1

Attention: Dr. H. Whaley

Re: Assessment of Potential Coal-Liquid Mixture
Fuel Utilization in Canada - Phase I
DSS File: 14SQ.234401-9080
Our File: DSS 7889-2/1.3

Gentlemen:

We are pleased to enclose our final report on Phase I of the subject study, incorporating changes made in response to your comments on the draft report of 28 December 1981. In particular, we would like to draw your attention to the following modifications:

1. We checked the boiler data supplied by the Scotia Liquicoal Study to the Nova Scotia Dept. of Mines and Energy against those of the Provincial Boiler Inspector's list. This check resulted in a substantial increase in the number of industrial boilers to be included in the assessment.

2. Because of the greatly increased number, we have found it expedient to design a computer program to calculate the coal quantities required in substituting COM and CWM for fuel oil. Some of the printout sheets are attached to the report under Appendix C.

3. In the draft report, we calculated the coal quantities for each boiler category by assuming that steam capacity losses due to the conversion to COM or CWM will be compensated by the installation of new coal-fired boilers, if the total of these losses in that category exceeds 20,000 lb/hr.

. 2

We have now concluded that the results will be improved by assuming the threshold of 20,000 lb/hr for each owner rather than for each category. This means that a replacement boiler would be installed if the sum total of the steam capacity losses resulting from converting every boiler to CLM in an industrial plant exceeds 20,000 lb/hr, even if all the boilers do not belong to the same category.

4. In the draft report, the coal quantities were established from the calculated full load fuel rates and the capacity factors given by the owners. We have now modified this, and the new coal quantities are based on actual annual oil burn rates.

5. These changes substantially increased the potential coal quantities that may be required. If the potential demand is to be fully met, the 1,000,000 short tons/yr production capacity of the Donkin Mine coal would also have to be added to the 1,100,000 short tons/yr of the coal produced from the Prince Mine.

We trust you will find the report satisfactory.

Yours very truly,

S. Detre

S. Detre
Manager, Thermal Study Group

SD/cr
cc: Dr. M. Brock, DSS *
Dr. R. Thomson, Canmet *

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PART 1

GENERAL

PART 1 - GENERAL

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PART 1 - GENERAL

1.1 INTRODUCTION

The rapid depletion of oil resources has spawned many ideas for more extensive utilization of coal which, even by the most conservative estimates, will be in plentiful supply for centuries to come. Coal gasification and liquefaction, fluidized bed combustion and magneto-hydro-dynamics are some of the ways being explored in all industrial countries to achieve this objective.

Besides its extensive use in motor vehicles, where large scale substitution by any other fuel will have to be preceded by the creation of a completely new distribution network, vast quantities of oil are being burned in steam generators of utilities, as well as in industrial processes, where, in principle, coal could perform the same function. Accordingly, conversion to coal in industrial and utility applications is being pursued in many countries, along with intensive research and development efforts aimed at mitigating the deleterious environmental effects resulting from the increased combustion of coal.

Although only a few decades ago the overwhelming majority of steam generators in utilities and industries relied on coal, and a substantial number of boilers currently in operation were originally designed to burn coal, many of them had been converted to oil, when its easier handling and cleaner combustion was accompanied by low price and reliability of supply. The conversion made coal conveyors, pulverizers, grates, ash handling equipment redundant; these components were either left to rust or discarded and the space thus liberated taken over by other plant auxiliaries.

As a result, conversion to coal is not easy even in boilers that were once operating on coal. It is even more difficult for boilers which, although designed liberally enough for coal combustion, have been installed without regard to the additional space needed for coal and ash handling. And the conversion to coal of steam generators, whose furnace and tube banks have been laid out only for oil, could easily turn out to be more costly than the installation of a new coal-fired boiler.

The mixture of finely ground coal with oil (COM), suggested some years ago, appeared to offer a way out of these difficulties. COM could be prepared outside the boilerhouse, and be piped to the burners just like oil, without taking up extra space around the boiler. If combined with coal beneficiation and with sufficient soot-blowers installed in the boiler, COM promises a reasonable clean operation.

COM combustion tests were conducted in numerous utilities in the U.S.A. and Japan and confirmed both the potential savings and the difficulties foreseen: burner erosion, furnace slagging, tube

fouling, and capacity loss due to the lower calorific value by weight of the coal compared to oil.

Since COM was first suggested, other mixing agents (methanol, alcohol, etc.) have been proposed, the latest being water. Coal/water mixture (CWM) has the obvious advantage of entirely dispensing with oil. It also brings the largest capacity reduction and the threat of more extensive erosion and shorter burner life.

The various mixtures of coal with a combustible or non-combustible liquid (coal/liquid-mixture, CLM) are now undergoing rapid development with a view to their introduction as a short-term measure in boilers and industrial processes currently burning oil.

In order to gain improved perception of the effects of the world wide introduction of coal/liquid mixtures, the International Energy Agency (IEA) requested its member countries for an assessment of their potential market for CLM.

As part of Canada's contribution to this effort, Montreal Engineering Company, Limited (Monenco) was awarded a contract by the Canada Centre for Mineral and Energy Technology (CANMET) for conducting the first phase of this assessment in the province of Nova Scotia. The phase is to be followed by a similar assessment covering the entire country.

1.2 SCOPE

This study, based on the objectives described in the "Guidelines for Subtask A: Assessment of Potential CLM Utilization" provided by CANMET, covers the following areas:

- Subtask A1: Fuel resources
- Subtask A2: Boiler and Combustor data: a survey of the utility boilers, industrial boilers and industrial process heaters/combustors, rated at 20 million BTU/hr or greater, installed in the Province of Nova Scotia.

- Subtask A3: Environmental data: national and local emission standards for fuel combustion.

1.3 EXCLUSIONS

In agreement with the Scientific Authority, all aspects of coal and oil transportation and CLM preparation plants have been excluded from the assessment.

1.4 METHODOLOGY

The methodology adopted to fulfill the objectives of the study was developed from the proposal submitted to CANMET by Monenco in July 1981. It consisted of the following:

141 Resources

Through a review of recent Energy Mines and Resources' publications (see References at the end of Part 2) and personal contacts with responsible individuals in Cape Breton Development Corporation and EMR, an assessment of the present and future potential of Sydney's Prince Mine was made. Prince Mine was recommended by CANMET as the projected supplier of coal for CLM application. However, after having calculated the coal quantities required for CWM preparation under the assumption that every boiler and process heater (rated at 20 million BTU/hr or higher) would be converted, it was found that the projected full capacity of Prince Mine (1,100,000 short tons p.a.) would leave a shortfall of approx. 1,020,500 short tons p.a. This, according to Cape Breton Development Corporation, would have to be covered from the Donkin Mine. While the above assumption somewhat overestimates the coal quantities needed, data of Donkin mine coal are also given to round out the report.

142 Oil-Fired Boiler Survey

Three slightly different questionnaire formats were prepared to accumulate the requested statistical data by CANMET. These consisted of the forms requesting information on:

- Utility boilers
- Industrial boilers
- Industrial process heaters/combustors

Most of the information on Nova Scotia Power Corporation's generating stations was available in-house. However, isolated gaps in certain areas such as unit capacity factors or available space for coal handling equipment, etc. were supplied by the Nova Scotia Power Corporation, who completed the questionnaires.

Of the six generating stations in Nova Scotia, one is no longer in operation and three are coal-fired. The two remaining ones, meeting the conditions of the survey, were the Point Tupper and Tuft's Cove Power Stations. These two stations represent a total installed gross capacity of 580 MWe.

On the industrial side, the initial contact with the Boiler Inspector's Office in Halifax identified some of the industrial and commercial establishments with boilers or process heaters rated at or above the threshold capacity of 20 million Btu/hr heat input. The remaining industrial/commercial users of such size boilers in the province were recognized through the information supplied by the Nova

Scotia Department of Energy and Mines. Out of about eighty establishments contacted, twenty-eight were found to qualify for the survey and were given the questionnaires. One hundred percent of the companies contacted for the survey responded and provided the requested information. Data on sixty-nine boilers, meeting the requirements, provide the basis for this assessment study.

Although a great number of furnace combustors are operating in the Sydney Steel Plant, their capacity could not be ascertained, nor is it safe to state that present-day commercial technology is in place for converting the combustors in the various types of steel mill furnaces to COM or CWM. Because of this, the SYSTCO industrial combustors could not be included in the data sheets. We have, however, calculated the maximum coal quantity required on the assumption that the oil now burned in these combustors would also be replaced by coal. Three industrial heaters, identified at the ESSO Petroleum refinery, were not included in the CLM conversion analysis, since only less than 20% of their heat generation is by oil.

Tables presented in Appendix A provide the complete list of utility stations and industrial/commercial organizations covered in the survey and list the specific characteristics of each boiler as identified by its owner.

143 Environmental Regulations

In-house data were used to summarize the Federal, Provincial and local regulations on emission standards, water usage and waste disposal.

1.5 REPORT ORGANIZATION

151 Sequence

In the "Guidelines", mentioned in Section 1.2 above, the Fuel Resources are in Subtask A1, preceding Subtask A2: Boiler and Combustor Data, and Subtask A3: Environmental data. We have complied with the sequence stipulated. However, we have included the calculation of the required coal quantities in Appendix B of the report.

152 Numbering

For easier identification of the information by the IEA, we have also adopted the numbering system of the Guidelines.

PART 2

SUBTASK A1: FUEL RESOURCES

PART 2 - SUBTASK A1 FUEL RESOURCES

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PART 2 - SUBTASK A1: FUEL RESOURCES

1.0 COAL FOR CLM APPLICATIONS

The data below is in keeping with the title: it is restricted to the coal intended and/or required for CLM applications, without considering the much larger quantities of thermal and metallurgical coal being mined in Nova Scotia.

1.1 COAL SUPPLIES (Current Situation)

A. Domestic
See Comments

B. Imported
None

C. Domestic and Imported
See Comments

Comments:

Except for small quantities required for COM bench scale tests in Halifax, and shipped abroad for CWM burner development, there is no current requirement for coal in Nova Scotia to prepare CLM.

The small quantities for developmental work have been taken from Prince Mine.

1.2 ESTIMATED ADDITIONAL COAL REQUIREMENTS FOR CLM APPLICATIONS

The additional coal quantities required for CLM applications have been estimated for the year 1985 under the following set of assumptions:

121 Due to the prevailing uncertainty as to the future development of the industry of Nova Scotia, some respondents to our questionnaires declined to forecast fuel requirements in the coming years; others stated that the requirements will remain substantially unchanged from that in 1981-82; three (the Nova Scotia Forest Industry, Scott Maritimes and Bowater Mersey) forecast a significant reduction of the oil burned by boiler house modifications resulting in increased use of bark and wood waste as fuel. Most other companies predicted cut backs in production due to decreasing market demands or economic hardships within the next five years.

Because of this, the 1985 coal demands were estimated on the basis of the owner predictions of oil consumption rates for that year or else, 1982. For those companies that could not predict their

future oil demands or did not provide any informatin at all, appropriate estimates were made. These estimates were based on the present steaming conditions of the boilers, such as capacity and input heat rates.

122 The quantities were estimated for the following two cases:

.1 Every candidate boiler and heater converted to coal-oil mixture (COM)

.2 Every candidate boiler and heater converted to coal-water mixture (CWM).

With these assumptions, the following CLM coal consumption can be forecast for Nova Scotia in the year 1985:

a. All COM: 996,524 short tons/year
b. All CWM: 2,120,474 short tons/year

Breakdowns of these values are presented in Appendix B.

1.3 THIS INCREASED TONNAGE CAN BE MET BY:

A. Increased domestic production

Comment: As stated in Item 1.5 below, this coal will be produced by the Prince Mine (1,100,000 short tons/yr) and the Donkin Mine (1,000,000 short tons/yr).

1.4 COAL CHARACTERISTICS (As received)

	Prince Mine*	Donkin Mine*
HHV, Btu/lb	11,100	12,000
Proximate Analysis (in % weight)		
Volatiles	30-31	30-32
Fixed Carbon	42-47	48-50
Ash	14-16	14-18**
Moisture	7-9	6
Ultimate Analysis (in % weight)		
Carbon	65	84-85
Moisture	7-9	6
Hydrogen	5	5.5
Sulphur	3-4	2.6-4.5
Nitrogen	2	1.5

	Price Mine*	Donkin Mine*
Oxygen	1-6	4.5-5.0
Ash	14-16	14
Grindability (Hardgrove)	60-65	65-70

* Reference 4
** Higher ash contents are expected prior to 1988.

Ash Fusion temperatures (°F)		
Initial	2282	2444
Softening	2400	2532
Fluid	2534	2588
Inorganic/organic sulphur ratio	Not advisable to be presented as a fixed ratio since the inorganic sulphur content of the coal from both mines may vary considerably from time to time (i.e. it may range from 87 to 136/30).	
Susceptibility to physical beneficiation	very susceptible	yes to some extent

* Reference 4.

1.5 COAL TYPE/MINE

Prince Mine	High Volatile B-bituminous
Donkin Mine	High volatile A-bituminous

1.6 MINING SITE

See attached map Fig. 1.

2.0 OIL FOR CLM APPLICATIONS

All information below applies to future coal-liquid mixtures. The assumptions listed in Items 121 and 122 apply.

2.1 GRADE OF OIL USED:

A: No. 6 fuel oil (for COM only)

Comment: No. 2 oil would be used in small quantities if spherical coal agglomeration were introduced as a coal pretreatment for COM preparation.

2.2 OIL SUPPLIES

B. Domestic, refined from Venezuelan crude

2.3 OIL CHARACTERISTICS

Typical Type 6 Fuel Oils

HHV (BTU/lb)	18000 - 18500
Sulphur content (%)	0.57 - 3.6
Vanadium content (ppm)	39 - 500
Asphaltine	Data Not Available
Pour point °F	5 - 85
Viscosity SFS@122°F	39 - 332
Flash Point °F	150 +

2.4 REFERENCES

.1 "Energy... A plan for Nova Scotia", a proposal from the Energy Planning Organization 1979.

.2 "Coal Resources and Reserves of Canada", Report ER 79-9, Energy Mines and Resources.

.3 "Coal: State-of-the-Art Technologies", Report by Atlantic Coal Institute, Sydney, Nova Scotia, 1981.

.4 Information received from Cape Breton Development Corporation.

FIG. I.– DISTRIBUTION OF OIL FIRED BOILERS AND PROCESS HEATERS IN PROVINCE OF NOVA SCOTIA

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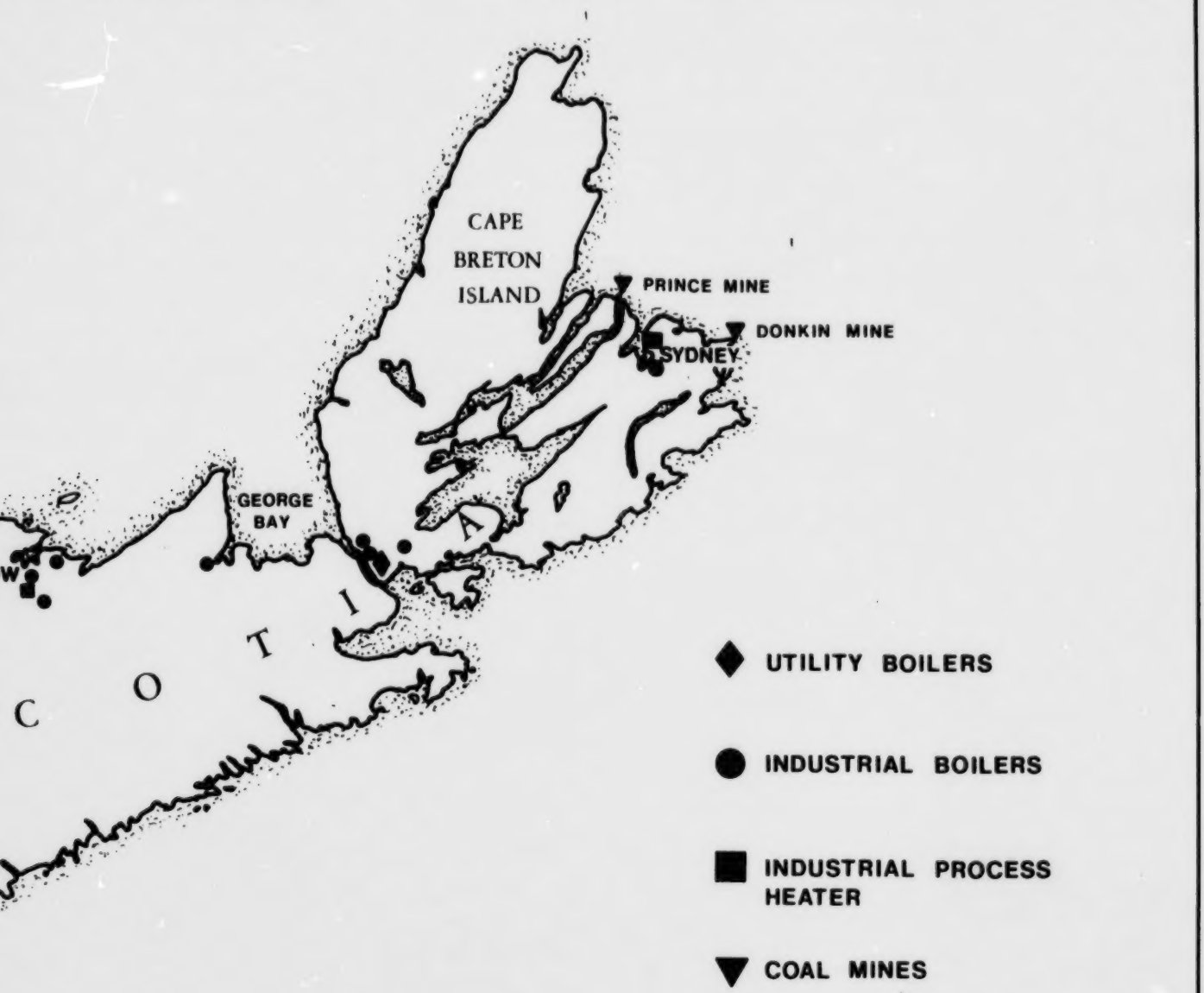
CAPE
BRETON
ISLAND
PRINCE MINE
DONKIN MINE
SYDNEY
GEORGE
BAY
UTILITY BOILERS
INDUSTRIAL BOILERS
INDUSTRIAL PROCESS
HEATER
COAL MINES

PART 3

SUBTASK A2: BOILER AND COMBUSTOR DATA

PART 3 - SUBTASK A2 BOILER AND COMBUSTOR DATA

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PART 3 - SUBTASK A2: BOILER AND COMBUSTOR DATA

1.1 UTILITY OIL-FIRED BOILER CATEGORIES

The Guidelines establish the following sub-divisions for these boilers

.1 Originally designed for coal-firing
.2 Originally designed for oil-firing
- . future coal capable
- . liberal design
- . compact design

and provide the definition for "future coal capable" as follows:

"An oil-designed boiler with future coal capability is a boiler which was designed with allowance for coal firing. It may have space for pulverizers, coal piping, and coal handling systems in the original design. It is possible that a future coal-capable boiler would have a large furnace volume and wider superheater tube spacing relative to a conventional oil-designed boiler." They also indicate characteristics for liberal design and compact design oil-fired boilers:

Boiler Characteristics / Category	Liberal Design	Compact Design
1. Furnace heat release rate, kBtu/cf/hr	17-22	22-31
2. Superheater tube spacing (first row, center-to-center)inches	12 or larger	6-12
3. Distance, top row burners to furnace outlet, ft.	35-45	Less than 35
4. Furnace exit gas temperature, °F	2100-2300	2300-2600
5. Maximum flue gas velocity, ft/sec	60-80	80-120
6. Furnace bottom hopper	Adequately sloped furnace hopper with ash collection system	Lower sloped furnace hopper or flat furnace bottom without ash collection system

In collecting and summarizing data on oil-fired utility boilers, we have found one unit (Tuft's Cove No. 2) to cut across the line dividing the categories. Space has been provided for coal bunkers, ash pit, precipitator, etc. On the other hand, the boiler design characteristics place this unit into the "compact design" category.

In the summary Tables, we included Tuft's Cove No. 2 unit in the compact design group.

Tables 1, 2 and 3, given at the end of this Section, summarize the statistical data of the oil-fired utility boilers in the Province of Nova Scotia.

111 Oil-Fired Utility Boiler, Originally Designed for Coal

A. Total Capacity in MWe 180

B. Number of Units (Boilers) 3

C. Age Distribution (Number and capacity by age)

Years Old	No. of Units	Capacity (lb/hr)
11-15	2	1,200,000
16-20	1	725,000

D. Size Distribution (Number and capacity by size)

Size (lb/hr)	No. of Units	Capacity (lb/hr)
500,000-700,000	2	1,200,000
710,000-900,000	1	725,000

E. Capacity Factor

Range	0.41 - 0.81
Average	0.64

F. Geographical Distribution See map (Fig. 1)

G. Major Manufacturers Babcok-Wilcox Canada, Limited

112 Oil-Fired Utility Boiler, Originally designed for Oil, Future Coal Capable

None

113 Oil-Fired Utility Boiler, Originally Designed for Oil, Liberal

None

114 Oil-Fired Utility Boiler, Originally Designed for Oil, Compact

A. Total capacity in MWe 400

B. No. of Units (boilers) 3

C. Age distribution (Number and capacity by age)

Years Old	No. of Units	Capacity (lb/hr)
11-20	3	1,925,000

D. Size Distribution (Number and capacity by size)

Size (lb/hr)	No. of Units	Capacity (lb/hr)
500,000-700,000	2	1,200,000
710,000-900,000	1	725,000

E. Capacity factor

Range	0.29 - 0.68
Average	0.53

F. Geographical location See map (Fig. 1)

G. Major Manufacturers Babcock & Wilcox Canada, Limited and CE Canada

UTILITY OIL-FIRED BOILERS

TABLE 1 - STATISTICAL DATA

Boiler Categories / Statistical Data		Total Generating Capacity MWe	No. of Boilers	Range of Capacity Factors	Average Capacity Factor	Boiler Manufacturer	Comments
Originally Designed for Coal-Firing		180	3	0.41 - 0.81	.64	B&W	-Tuft's Cove Unit No. 1 - 100 MWe - Pt. Tupper Cogeneration plant, 1a and 1b - 80 MWe
Originally Designed for Oil-Firing	Future Coal Capable	--	--	--	--	--	
	Liberal Design	--	--	--	--	--	
	Compact Design	400	3	.29-.68	.53	B&W CE	Tuft's Cove unit no. 2-100 MWe, Tuft's Cove unit No. 3 - 150 MWe, and Pt. Tupper Unit No. 2 - 150 MWe. Tuft's Cove Unit No. 2 has space for coal firing equipment (bunkers, pulverizers, ash hoppers, etc.)

UTILITY OIL-FIRED BOILERS

TABLE 2 - AGE DISTRIBUTION BY CAPACITY & NUMBER

Boiler Categories \ Age Groups		11 - 20 (1961-1970)	1 - 10 (1971-1980)	Less than 1 year old (1980-Present)
Originally Designed for Coal-Firing		Point Tupper 1a & 1b 2x600,000lb/hr Tuft's Cove Unit No.1 725,000 lb/hr	-	-
Originally Designed for Oil-Firing	Future Coal Capable	-	-	-
	Liberal Design	-	-	-
	Compact Design	-	Point Tupper Unit No. 2 1,050,000 lb/hr Tuft's Cove Unit No. 2 700,000 lb/hr Tuft's Cove Unit No. 3 1,050,000 lb/hr	-

UTILITY OIL-FIRED BOILERS

TABLE 3 - SIZE DISTRIBUTION BY CAPACITY & NUMBER*

Boiler Category \ Size Distribution		500,000 to 700,000 lb/hr	710,000 to 900,000 lb/hr	910,000 to 1,100,000 lb/hr
Originally Designed for Coal-Firing		T.C.=1,200,000 N.U. = 2	T.C. = 725,000 N.U. = 1	-
Originally Designed for Oil-Firing	Future Coal Capable	-	-	-
	Liberal Design	-	-	-
	Compact Design	T.C.= 700,000 N.U = 1	-	T.C. = 2,100,000 N.U. = 2

* T.C. = Total Steam Generating Capacity in lb/hr
N.U. = Number of Units (Boilers)

2.1 INDUSTRIAL OIL FIRED BOILER CATEGORIES

The Guidelines established the following subdivision for industrial boilers.

".1 Originally Designed for Coal-Firing
.2 Originally Designed for Oil-Firing
- Packaged Firetube Boilers
- Packaged Watertube Boilers
- Modular and Field Erected Boilers

The first category of industrial boilers includes both stoker and pulverized coal-fired boilers which were converted to oil-firing when oil was economical and its supply guaranteed.

The second category is divided into three distinctive sub-categories. The firetube boilers are generally small. The package watertube boilers have been developed around the use of petroleum fuels. For these premium fuels, the furnace volumetric heat release rate is higher than for field-erected boilers. The compact design of a package watertube boiler results in closer tube spacings which consequently lead to higher gas velocities. The Nova Scotia Forest Industry's two boilers were not considered in the CLM application analysis since the Company plans on replacing the two with a bark-fired unit in near future."

Detailed characteristics and type of industrial boilers as collected from the owners are included in Appendix A.

One additional category, "Boilers Originally Designed for Dual-fuel Combustion", was identified during the survey and later added to the breakdown of the Industrial Oil-Fired Boilers. In this category two units (Bowater's Unit No. 4 and Scott Maritimes' Unit No. 1) were identified using hog fuel bark and wood waste as primary fuel and oil only as supplementary fuel. These two boilers were not included in the CLM application analysis since they are being considered for future reductions in oil consumption by increasing the firing of bark or hog fuel.

One other company, the N.S. Forest Industry, which operates two oil-fired boilers totaling 500,000 lb/hr of steaming capacity, plans to replace the two units by an equivalent size boiler in the near future. The replacement unit will operate on bark and will use oil only as supplementary fuel. The two units now in operation were, therefore, excluded from the CLM analysis.

Tables 4, 5 and 6 summarize the statistical data on the industrial oil-fired boilers in the Province of Nova Scotia.

211 Oil-Fired Industrial Boiler, Originally Designed for Coal

A. Total capacity in input heat rate, Btu/hr 686.7×10^6

B. Number of units (boilers) 18

C. Age distribution (number and capacity by age)

Years Old	No.	Capacity (lb/hr)
Less than 1	--	--
1 - 10	--	--
11 - 20	3	100,000
21 - 30	12	370,000
31 - 40	3	90,000

D. Size distribution (number and capacity by size)

Size (lb/hr)	No. of Units	Capacity (lb/hr)
10,000 - 50,000	17	500,000
51,000 - 100,000	1	60,000

E. Capacity factor

range	.04 - .03
average	.18

F. Geographical distribution See map (Fig. 1)

G. Major manufacturers of boilers Babcock & Wilcox Canada, Ltd.
Foster Wheeler Ltd.
Vickers Keeler
Dominion Bridge

H. Major Industrial users College; Hospital;
Canadian Forces Base.

212 Oil-Fired Industrial Boiler, Originally Designed for Oil, Package Firetube

A. Total capacity in input heat rate, Btu/hr: 225.6×10^6

Number of units (boilers) 9

C. Age distribution (number and capacity by age)

Years Old	No. of Units	Capacity (lb/hr)
less than 1	1	14,000
1-10	2	41,400
11-20	6	130,000

D. Size distribution (number and capacity by size)

Size (lb/hr)	No. of Units	Capacity (lb/hr)
10,000 - 50,000	9	185,400

E. Capacity factor

range	.08-.50
average	.18

F. Geographical distribution — See map (Fig.1)

G. Major manufacturer — Cleaver Brooks
Volcano

H. Major industrial user — University; Agricultural College; Manufacturers

213 Oil-Fired Industrial Boiler, Originally Designed for Oil, Package Watertube

A. Total capacity in input heat rate, Btu/hr — $1,976.5 \times 10^6$

B. Number of units — 29

C. Age distribution (number and capacity by age)

Years Old	No.	Capacity (lb/hr)
less than 1	1	80,000
1-10	15	916,000
11-20	10	395,000
21-30	3	174,000

D. Size distribution (No. and capacity by size)

Size (lb/hr)	No. of Units	Capacity (lb/hr)
10,000-50,000	17	595,000
51,000-100,000	12	970,000

E. Capacity factor

range	.01-.66
average	.24

F. Geographical distribution — See map- (Fig. 1)

G. Major manufactuers — Babcock & Wilcox Canada
Vickers Keeler
Foster Wheeler Ltd.
Volcano
Dominion Bridge

		Combustion Eng. Cleaver Brooks Toronto Iron Works
H.	Major industrial users	Tire manufacturer; University; Hospital; Transport equipment-Manufacturer; Greenhouses; Oil Refinery; Salt Co.; Dockyard; Fiber manufacturer
I.	Type of boilers	SA; AGM570; D;A

214 Oil-Fired Industrial Boiler, Originally Designed for Oil, Modular and Field Erected Watertube

A. Total capacity in input heat rate, Btu/hr $2,225.9 \times 10^6$

B. Number of units 11

C. Age distribution (Number and capacity by age)

Years Old	No. of Units	Capacity (lb/hr)
Less than 1	--	--
1-10	--	--
11-20	6	1,138,000
21-30	5	415,000

D. Size distribution (Number and Capacity by size)

Size (lb/hr)	No. of Units	Capacity (lb/hr)
10,000- 50,000	3	78,000
51,000-100,000	-	-
101,000-200,000	6	925,000
201,000-300,000	2	550,000

E. Capacity Factor

range	.01-.43
average	.44

F. Geographical Distribution — See map (Fig. 1)

G. Major Manufacturers — Babcock & Wilcox, Canada; Foster Wheeler

H.	Major Industrial user.	Pulp and paper Industry Steel Industry Oil Refineries Forest Industry Greenhouse

3.1 OIL-FIRED PROCESS HEATERS AND COMBUSTORS

The Guidelines establish the following categories for the process heaters and combustors:

"The oil-fired industrial process heaters and combustors will be classified into the following categories according to the original design fuel, the industry and the application.

.1 Originally designed for coal-firing
- Industry
- Application

.2 Originally designed for oil-firing
- Industry
- Application"

311 Oil-Fired Industrial Process Heater, Originally Designed for Coal, Industry and Application

- None -

312 Oil-Fired Industrial Process Heater, Originally Designed for Oil, Industry and Application

A.	Total capacity in input heat rate,	Btu/hr	63.8×10^6
B.	Number of units (heaters)		1
C,D	Age & Size	14 yrs.	2.64×10^6 Btu/hr
E.	Capacity Factor		.91
F.	Geographical distribution		see map (Fig. 1)
G.	Major Manufacturer		Allis Chalmers
H.	Major industrial user		Scott Maritimes
I.	Application		Lime Kiln.

NOTE: Regarding the Sydney Steel Corporation's - Oil-fired process heaters and combustors, please refer to Part 1, Section 142 of this report.

INDUSTRIAL OIL-FIRED BOILERS

TABLE 4 - STATISTICAL DATA

Boiler Design / Statistical Data		Total Steaming Capacity lb/hr	Total Capacity in Input Heat Rate 10^6 Btu/hr	No. of Boilers	Range of Capacity Factors	Average Capacity Factor	Boiler Manufacturer
Originally Designed for Coal-Firing		560,000	686.7	18	.04-.03	.18	FW B&W Vickers-Keeler Dominion-Bridge
Originally Designed for Oil-Firing	Packaged Firetube	185,400	225.6	9	.08-.50	.18	Cleaver-Brooks Volcano
	Packaged Watertube	1,565,000	1,976.5	29	.01-.66 (Note 1)	.24 (Note 1)	FW B&W Vickers-Keeler DM; CE Cleaver-Brooks Toronto Iron Works
	Modular & Field Erected	1,553,000	2,225.9	11	.01-.43 (Note 1)	.44 (Note 1)	B&W FW
Originally Designed for Dual Fuel Combustion (i.e. Oil & Bark)		575,000	1,086.0	2	.37-.48	.41	B&W

Note 1: ESSO Refinery's boilers are fired on a typical 50% oil, 50% refinery waste gas basis. Therefore, only 50% of the boiler capacity factor was considered to account for the oil consumption alone.

INDUSTRIAL OIL-FIRED BOILERS

TABLE 5 - AGE DISTRIBUTION BY CAPACITY & NUMBER*

Boiler Categories \ Age Groups		31 - 40 (1941-1950)	21 - 30 (1951-1960)	11 - 20 (1961-1970)	1 - 10 (1971-1980)	Less than 1 yr old (1980-present)
Originally Designed for Coal-Firing		T.C. = 90,000 N.U. = 3	T.C. = 370,000 N.U. = 12	T.C. = 100,000 N.U. = 3		
Originally Designed for Oil-Firing	Packaged Firetube			T.C. = 130,000 N.U. = 6	T.C. = 41,400 N.U. = 2	T.C. = 14,000 N.U. = 1
	Packaged Watertube		T.C. = 174,000 N.U. = 3	T.C. = 395,000 N.U. = 10	T.C. = 916,000 N.U. = 15	T.C. = 80,000 N.U. = 1
	Modular & Field Erected		T.C. = 415,000 N.U. = 5	T.C.=1,138,000 N.U.=6		
Originally Designed for Dual Fuel Combustion				T.C. = 575,000 N.U. = 2		

* T.C. = Total Steam Generating Capacity in lb/hr.
N.U. = Number of Units (Boilers)

INDUSTRIAL OIL-FIRED BOILERS

TABLE 5 - AGE DISTRIBUTION BY CAPACITY & NUMBER*

Boiler Categories \ Age Groups		31 - 40 (1941-1950)	21 - 30 (1951-1960)	11 - 20 (1961-1970)	1 - 10 (1971-1980)	Less than 1 yr old (1980-present)
Originally Designed for Coal-Firing		T.C. = 90,000 N.U. = 3	T.C. = 370,000 N.U. = 12	T.C. = 100,000 N.U. = 3		
Originally Designed for Oil-Firing	Packaged Firetube			T.C. = 130,000 N.U. = 6	T.C. = 41,400 N.U. = 2	T.C. = 14,000 N.U. = 1
	Packaged Watertube		T.C. = 174,000 N.U. = 3	T.C. = 395,000 N.U. = 10	T.C. = 916,000 N.U. = 15	T.C. = 80,000 N.U. = 1
	Modular & Field Erected		T.C. = 415,000 N.U. = 5	T.C.=1,138,000 N.U.=6		
Originally Designed for Dual Fuel Combustion				T.C. = 575,000 N.U. = 2		

* T.C. = Total Steam Generating Capacity in lb/hr.
N.U. = Number of Units (Boilers)

INDUSTRIAL OIL-FIRED BOILERS

TABLE 6 - SIZE DISTRIBUTION BY CAPACITY & NUMBER*

Boiler Category / Size Distribution		10,000 to 50,000 lb/hr	51,000 to 100,000 lb/hr	101,000 to 200,000 lb/hr	201,000 to 300,000 lb/hr	301,000 to 400,000 lb/hr
Originally Designed for Coal-Firing		T.C.=500,000 N.U.=17	T.C.=60,000 N.U.=1			
Originally Designed for Oil-Firing	Packaged Firetube	T.C.=185,400 N.U.=9				
	Packaged Watertube	T.C.=595,000 N.U.=17	T.C.=970,000 N.U.=12			
	Modular & Field Erected	T.C.= 78,000 N.U.= 3		T.C.=925,000 N.U.=6	T.C.=550,000 N.U.=2	
Originally Designed for Dual Fuel Combustion				T.C.=175,000 N.U.=1		T.C.=400,000 N.U.=1

* T.C. = Total Steam Generating Capacity in lb/hr.
N.U. = Number of Units (Boilers).

INTRODUCTION

For most Canadian industries, liquid effluent concentrations and air emission standards are limited to levels consistent with the application of best practicable technology through regulations established under Section 33 of the Fisheries Act which prohibits "the deposit of a deleterious substance of any type of water frequented by fish..." and under the authority of the Clean Air Act specifies "containment based on best practicable technology to prevent emissions at source".

Environment Canada's pollution control policy consists of two successive phases:

Phase 1: Best practicable control technology to be applied to reduce or eliminate the discharge or emission of undesirable substances to the environment. This is done for each industrial sector through a program of national baseline controls which apply uniformly across Canada.

Phase 2: Ambient water quality and air quality objectives defining upper limits for specific parameters in the environment are used to determine (a) whether best practicable control technology is achieving an acceptable level of environmental quality and (b) what more stringent control is required if best practicable technology is not sufficient to achieve acceptable quality levels.

(In the following Sections, the numbering system of the Guidelines has been applied, with such deviations as were unavoidable on account of the difference between the Canadian Government's approach to environmental regulations and that implied in the Guidelines.)

1.0 NATIONAL REGULATIONS ON TRANSPORTATION, PREPARATION, STORAGE AND HANDLING

In July 1979, Environment Canada prepared a first draft of an 'Environmental Codes of Practice for Steam-Electric Generation' (Ref 4) which developed guideline recommendations for water related concerns within the thermal power generation industry. The environmental codes define the position that the Federal government will take on environmental matters in dealing directly with or providing advice to other agencies who are dealing with the development of new steam - electric generating stations or generating station expansions in Canada. Although they are not regulations, the recommendations on water related concerns contained in the codes will be considered by the Federal government as baseline requirements for assuring provisions of the Fisheries Act are being effectively implemented.

The Environmental Codes of Practice outline a series of recommendations which apply to subject areas such as the transportation, storage and handling of fuels. These recommendations are summarized as follows (Source: Ref. 4):

.1 Recommendation B.III.2

All fuel storage and handling areas are to be:

- sited and/or lined, provided with underdrainage or otherwise prepared during construction to prevent the contamination of groundwater.

- prepared, diked and/or serviced by collection systems to prevent the escape of surface run-off or fuels during the maximum precipitation occurrence in the site area.

.2 Recommendation B.III.3

For chemicals stored on the station site:

- areas for bulk storage of chemicals are to be adequately sited, prepared, diked and/or serviced by collector systems to prevent the escape of chemicals during the maximum precipitation occurrence in the site area.

- all storage areas are to be adequately serviced by containment and/or collector systems to prevent the escape of maximum spills or spill contaminated substances during the maximum precipitation occurrence in the site area.

- bulk storage areas for chemicals which react violently with one another are to be separate and serviced by separate containment and collector systems.

- all chemicals should be evaluated from an aquatic toxicity viewpoint and any toxic chemicals should receive special attention through separate and complete containment with possible leaks directed to treatment facilities.

- oil storage areas should be completely contained with sufficient capacity to contain all liquid stored and with collected wastes directed to an oil separation system.

1.1 FUGITIVE DUST

There are no Federal Regulations or Guidelines which deal with fugitive dust emissions resulting from the transportation, preparation, storage and handling of fuels.

1.2 LEACHING FROM COAL STORAGE PILES

The Federal guidelines for controlling the discharge of leachates from coal storage piles are outlined under the above-mentioned Recommendation B.III.2 of the Environmental Codes of Practice for Steam Electric Power Generation (Ref 4). This guideline recommends that coal pile storage and handling areas be adequately graded, dyked or prepared to ensure the collection of runoff and facilitate reuse or treatment of the waste streams. The guideline specifies that in no instances should wastewaters arising in those areas be permitted to escape into adjacent surface waters or seep into groundwater systems. National Guidelines dealing with the quality of liquid effluents from thermal power plants are outlined in Section 4.0.

1.3 HYDROCARBON EMISSIONS

There are no Federal Regulations or Guidelines which present maximum recommended levels for hydrocarbons being discharged to the atmosphere. Maximum recommended values for hydrocarbons in liquid effluents are discussed in Section 4.0.

2.0 NATIONAL REGULATIONS ON EMISSION STANDARDS

2.1 APPLICABLE TO NEW THERMAL POWER GENERATION FACILITIES

The Federal Minister of the Environment issued emission guidelines for the thermal generating industry in April 1981. These guidelines require that thermal plants beginning commercial operation after 1 May 1981 and having a rated heat input and capacity in excess of 250 x 10^6 Btu/hr meet emission guidelines for SO_2, NO_x, particulates and opacity as follws: (Ref. 1)

.1 SO_2

- no control for units emitting less than 0.6 lb/10^6 Btu.
- units emitting from 0.6 to 6 lb/10^6 Btu require controls to bring emissions to 258 ng/J.
- units emitting more than 6 lb/10^6Btu require controls for 90% SO_2 removal.

.2 NO_x

Maximum emissions expressed as NO_x as follows:

- 0.6 lb/10^6 Btu for solid fossil fuels.
- 0.3 lb/10^6 Btu for liquid fossil fuels.
- 0.2 lb/10^6 Btu for gaseous fuel.
- 0.1 lb/10^6 Btu for all other fuels.

.3 Trace Elements

- no guideline levels specified.

.4 Comments

The National Guidelines also specify a limit for opacity as follows:

- maximum opacity of 20%.
- may increase to 40% for not more than six minutes in any 60 minutes.

Compliance with these guidelines is on the basis of a 720 hour (30 day) rolling average. The rolling average is calculated hourly for the previous 720 hours hourly emissions.

The implications of these guidelines, if promulgated as drafted, will essentially require that all new installations in Eastern Canada will have to scrub unless they are able to secure supplies of low sulphur western coal. These guidelines will also have an impact on the choice of mixes pursued by Eastern Canada utilities.

The Federal government has also issued ambient air quality objectives for air contaminants. These are presented in Table 7, page 4-9.

2.2 APPLICABLE TO BOILERS AT FEDERAL ESTABLISHMENTS

The Federal Department of the Environment has developed guidelines to indicate the air contaminant emission quality that will be applicable to all gases discharged from existing and proposed federal boiler installations. These guidelines apply to new and existing boiler facilities at Federal establishments under the direct authority of the Federal government. The guidelines suggest that in order to ensure that proposed boiler facilities meet the federal and provincial environmental guidelines, plans and specifications should be submitted for review by EPS prior to tender. The guidelines specify that air emissions at new and existing installations be limited to the following:

2.3 NEW INSTALLATIONS

.1 SO_2

- 1.1 $lb/10^6$ Btu heat input for all units less than or equal to 10 million Btu/hr heat input.
- 1.64 $lb/10^6$ Btu heat input for all units greater than 10 million Btu/hr heat input.

.2 Particulates

- 0.1 $lb/10^6$ Btu heat input for all units less than or equal to 10 million Btu/hr heat input.
- 0.2 $lb/10^6$ Btu heat input for all units greater than 10 million Btu/hr heat input.

.3 Opacity

- should not exceed 5%

.4 Boiler Stack Height

- the stack of a new installation should be designed so that flue gases containing air contaminants limited to the levels

specified in the guideline are discharged into the ambient air at sufficient height, velocity and temperature so as to cause a one hour average impingement concentration no greater than the following:

- SO_2 - 450 $\mu gm/m^3$ of air.
- NO_2 - 200 $\mu gm/m^3$ of air.
- Particulates - 200 $\mu gm/m^3$ of air.

2.4 EXISTING INSTALLATIONS

.1 SO_2 and Particulates

- the sulphur dioxide and particulates emitted into the air from an existing installation should not create a nuisance or air pollution as defined in the guideline.

.2 Opacity

- should not exceed 20%.

.3 Boiler Stack Height

- SO_2 - 800 $\mu gm/m^3$ of air.
- NO_2 - 400 $\mu gm/m^3$ of air.
- Particulates - 240 mgm/m^3 of air.

TABLE 7

Federal Ambient Air Quality Objectives for Air Contaminants

Contaminant	Units	Concentrations Desirable	Concentrations Acceptable	Concentrations Tolerable	Comments
Sulphur dioxide	$\mu g/m^3$	0-30	30-60	-	Annual arithmetic mean
		0-150	150-300	300-800	Over a 24 hr period
		0-450	450-900	-	Over a 1 hr period
Suspended particulate matter	$\mu g/m^3$	0-60	60-70	-	Annual geometric mean
		-	0-120	120-400	Over a 24 hr period
Carbon monoxide	$\mu g/m^3$	0-6	6-15	15-20	Over an 8 hr period
		0-15	15-35	-	Over a 1 hr period
Oxidants (ozone)	$\mu g/m^3$	-	0-30	-	Annual arithmetic mean
		0-30	30-50	-	Over a 24 hr period
		0-100	100-160	160-300	Over a 1 hr period
Nitrogen dioxide	$\mu g/m^3$	0-60	0-100	-	Annual arithmetic mean
		-	0-200	200-300	Over a 24 hr period
		-	0-400	400-1000	Over a 1 hr period
Hydrogen sulphid	$\mu g/m^3$	-	0-5	-	Over a 24 hr period
		0-1	1-15	-	Over a 1 hr period
Hydrogen fluoride	$\mu g/m^3$	-	0-0.20[1]	-	70 day average
		-	0-0.35[1]	-	30 day average
		0-0.20[1]	0.20-0.55[1]	-	7 day average
		0-0.40[1]	0.40-0.85[1]	-	24 hr average

Sources: - The Clean Air Act - Compilation of regulations and Guidelines
Regulations Codes and Protocols Report EPS-1-AP-78-2
Air Pollution Control Directorate, November 1978
- 1981-1982 APCA Directory and Resource Book, Special Anniversary Edition,
Air Pollution Control Association

[1]proposed

3.0 NATIONAL REGULATIONS ON WATER USAGE

The Federal government has issued draft guidelines which apply to water usage in power industry in the form of an "Environmental Codes of Practice for Steam Electric Power Generation" (Reference 4). The following general cooling water withdrawal limitations are recommended:

RECOMMENDATION R 101

Unless it is demonstrated that larger withdrawals are no more detrimental environmentally, the volume of cooling water withdrawal should be such that:

- in all water body types, the total annual withdrawal (all sources) from the 50 km (or shorter) reach of nearshore waters on which a station is centered does not exceed 10 percent of the normal standing volume of that reach.

- in rivers, the total rate (all sources) of water withdrawal at any time from 50 km reach of river from the generating station upstream does not exceed 10 percent of the average flow in that reach of the river.

RECOMMENDATION R 102

Auxiliary cooling water systems at steam-electric generating stations should:

- be designed to minimize water intake to the degree practicable.

- be designed to accommodate maximum practicable reuse of discharge water for other plant processes.

- be closed-cycle in cases where the auxiliary cooling water flows not reused for other plant processes exceed 1.5 L/s per megawatt of installed capacity unless it is demonstrated that significant numbers of fish will not pass through intake screens.

3.1 IMPACT OF WATER USAGE IN CLM PREPARATION PLANTS

Refer to Section 3.3.

3.2 IMPACT OF WATER USAGE IN COAL PREPARATION PLANTS

Refer to Section 3.3.

3.3 COMMENTS

It is not possible to assess impacts of water usage at CLM and coal preparation plants except on a case by case basis. Service water requirements will vary significantly from station to station depending upon the type and size of the facility, source of supply, characteristics of the fuel and extent of water reuse.

4.0 NATIONAL REGULATIONS ON WASTE DISPOSAL

APPLICABLE TO THERMAL POWER GENERATION FACILITIES

The Federal 'Environmental Codes of Practice for Steam Electric Power Generation' present a series of recommendations which apply to the reuse and/or disposal of solid and liquid wastes from steam electric stations. These recommendations are summarized as follows:

RECOMMENDATION B.III.1

Service or process water should be supplied by withdrawal from the condenser or auxiliary cooling water discharge and/or by recirculation or reuse of station wastewater streams wherever it is practicable to do so.

RECOMMENDATION B.III.4

Ash systems which utilize water in the collection and transport of fly and/or bottom ash are to be recirculating water systems with minimum blowdown consistent with practical operating constraints.

RECOMMENDATION B.III.5

All potentially contaminated auxiliary cooling waters (conventional or reactor equipment cooling) should be recirculating systems with blowdown containment provisions.

RECOMMENDATION B.III.6

Air preheater and boiler fireside cleaning and other ash contacted wastewaters at oil-fired stations should be treated for maximum removal of vanadium.

RECOMMENDATION B.III.7

All laboratory and sampling wastes not amenable to normal waste-water treatment should be contained separately for off-site disposal.

RECOMMENDATION B.III.8

- oil equipped transformers should be equipped with containment systems capable of handling the maximum volume of oil in the event of tank rupture.
  - a single transformer installation should have a pit or perimeter channel containment system.
  - a multiple transformer installation should have an interconnected channel system with an oil containment pit capable of retaining the volume of oil expected in the most probable multiple tank rupture case.
- oil circuit breakers should have a containment system connected to the transformer system.
- existing systems using PCB equipped capacitators should employ a totally closed containment system, and existing supplies of PCBs should be stored where a totally closed containment system can be employed.
- the drains throughout the station switchyard should provide a network which leads to a containment and treatment area to avoid discharges to local water courses. This network should contain both run-off from adjacent areas and accidental discharges during transport from storage.

RECOMMENDATION B.III.9

Sanitary wastewater systems should be separate from other wastewater collector systems.

RECOMMENDATION B.III.10

In those situations where a sewage treatment system for station sanitary wastes is required, a minimum of secondary treatment should be provided.

RECOMMENDATION B.III.11

Solid and liquid waste disposal areas at steam-electric stations should:

- be sited and/or lined, provided with underdrainage or otherwise prepared during construction to prevent the contamination of ground water and/or nearby surface water systems.

- be prepared, diked and/or serviced by collection systems to prevent the escape of surface run-off from the disposal area during the maximum probable precipitation occurrence in the site area.

TABLE 8

Effluent Limitations

Elements and Parameters	Requirements
Iron	1.0 mg/L
Chromium	0.5 mg/L
Copper	0.5 mg/L
Nickel	0.5 mg/L
Zinc	0.5 mg/L
Vanadium (oil-fired stations only)	0.5 mg/L
Oil and Grease	15.0 mg/L
Total Suspended Solids	25.0 mg/L
ph	6.5 to 9.5

RECOMMENDATION B.III.12

For all wastewater (type 2) streams from steam-electric generating stations, the effluent limitations prescribed in Table 8 should be met before release.

'Type 2' streams encompass all station streams to which there is a known or potential addition of a deleterious substance. These include:

- air preheater, boiler fireside and stack cleaning, wastewaters and run-off.
- fuel storage and handling area wastewaters and runoff.
- dust suppression and equipment cleaning wastewaters.
- solid and/or liquid waste collection transport and/or disposal wastewater or runoff.
- water treatment, plant wastes, boiler blowdown, boiler waterside cleaning wastes, condensate polisher wastes, floor and yard drain wastewaters, sanitary wastewaters and laboratory wastewaters.
- closed-cycle condenser and auxiliary cooling water discharges, and once-through auxiliary cooling water discharges that are subject to potential contamination through use in water-to-oil (or other deleterious substances) heat exchangers.
- any heat generation or steam generation system wastewaters not included in the above which arise inside the station boundary and which meet type 2 stream specifications.
- any combination of the above streams.

APPLICABLE TO EFFLUENT QUALITY AND WASTEWATER TREATMENT AT FEDERAL ESTABLISHMENTS IN GENERAL

The Federal government has also developed guidelines which apply to all effluents discharged from land based establishments under the direct authority of the Federal government. These guidelines specify that effluents discharged to receiving waters should receive treatment such that an effluent of minimum quality is achieved as outlined in Table 9, page 4-18.

TABLE 9

Specific Limits for Effluent Quality

at Federal Establishments

Parameter	Concentration
5-Day Biochemical Oxygen Demand	20 mg/L
Suspended solids	25 mg/L
Fecal coliforms (MF method)	400 per 100 ml (after disinfection)
Chlorine residual	0.50 mg/L minimum after 30 minute contact time[1]
pH	6 to 9
Phenols	20 ug/l
Oils and grease	15 mg/L
Phosphorus (Total P)	1.0 mg/L[2]
Temperature	not to alter the ambient water temperature by more than 1°C[3]

[1]Applicable where chlorination is used for disinfection purposes.
[2]Applicable where phosphorus removal is required.
[3]Applicable at perimeters of mixing zone.

4.1 IMPACT OF INCREMENTAL WASTE DISPOSAL FROM BOILERS FIRING CLM

Refer to Section 4.4.

4.2 IMPACT OF WASTE DISPOSAL FROM CLM PREPARATION PLANTS

Refer to Section 4.4.

4.3 IMPACT OF WASTE DISPOSAL FROM COAL PREPARATION PLANTS

Refer to Section 4.4.

4.4 COMMENTS

Since service streams are used to dispose of the majority of the wastes produced by a station which do not escape into the atmosphere, the volume of intake generally reflects the volume of wastewater to be treated and discharged and the impact that these discharges will have on the environment. As indicated previously in Section 3.3, these aspects can really be assessed only on a case-by-case basis.

The impacts of individual CLM boilers and preparation plants will depend upon variables such as fuel characteristics, discharge volumes, effluent treatment practices and the nature of the receiving water system. These impacts must be assessed on a case-by-case basis.

5.0 LOCAL REGULATIONS ON TRANSPORTATION, PREPARATION, STORAGE AND HANDLING

Refer to Section 5.4

5.1 FUGITIVE DUST

Refer to Section 5.4

5.2 LEACHING FROM COAL STORAGE PILES

Refer to Section 5.4

5.3 HYDROCARBON EMISSIONS

Refer to Section 5.4

5.4 COMMENTS

The Nova Scotia Department of Environment does not have regulations as such which cover the environmental concerns related to the transportation, preparation, storage and handling of coal and coal liquid mixtures. Instead, the Province operates on a permit system for new facilities and for proposed modifications to existing facilities. Specific requirements covering fugitive dusts, leaching from coal storage piles, control of hydrocarbon emissions, in fact, all relevant aspects of water usage, solid and liquid waste disposal and air emissions are set, if deemed necessary by the Province, on a case-by-case basis. Site specific factors will determine whether the Federal standards (if applicable) are adopted or whether more stringent limits are imposed in each case.

6.0 LOCAL REGULATIONS ON EMISSION STANDARDS

The Noval Scotia Department of Environment has adopted the Federal Ambient Air Quality Objectives for Air Contaminants. These are outlined in Table 7. With regard to air emission standards, the Province has adopted the levels specified by the Federal guidelines as outlined in Section 2.0 for NO_x, particulates and opacity. At the present time, the Province does not enforce the Federal emission guidelines for SO_2 in order to encourage the use of Nova Scotia coals. They currently rely on other ways to minimize ambient SO_2 concentrations (e.g. fuel switching) in order to avoid imposing the widespread use of scrubbing systems for SO_2 removal (Oldreive, 1981).

7.0 LOCAL REGULATIONS ON WATER USAGE

Refer to Section 5.4

7.1 LOCAL IMPACT OF WATER USAGE IN CLM PREPARATION PLANT

Refer to Section 4.4

7.2 LOCAL IMPACT OF WATER USAGE IN COAL PREPARATION PLANT

Refer to Section 4.4

8.0 LOCAL REGULATIONS ON WASTE DISPOSAL

Refer to Section 5.4

8.1 LOCAL IMPACT OF INCREMENTAL WASTE DISPOSAL FROM BOILER FIRING CLM

Refer to Section 4.4

8.2 LOCAL IMPACT OF WASTE DISPOSAL FROM CLM PREPARATION PLANT

Refer to Section 4.4

8.3 LOCAL IMPACT OF WASTE DISPOSAL FROM COAL PREPARATION PLANT

Refer to Section 4.4

LIST OF REFERENCES

1. Department of the Environment. Clean Air Act. Thermal Power Generation Emissions - National Guidelines for New Stationary Sources. Part 1 Extra No. 27. Vol. 115. Ottawa, Saturday 25 April 1981.

2. Environment Canada. Air Pollution Guidelines. Applicable to Boilers at Federal Establishments. Regulations, Codes and Protocols Report EPS-1-EC-79-1. December 1979.

3. Environment Canada. The Clean Air Act - Compilation of Regulations and Guidelines. Regulations, Codes and Protocols Report EPS-1-AP-78-2.

4. Environmental Codes of Practice for Steam-Electric Power Generation. Design Phase Manual. First Draft 23 July 1979. Unpublished manuscript.

5. Environment Canada. Guidelines for Effluent Quality and Wastewater Treatment at Federal Establishments. Regulations, Codes and Protocols Report EPS-1-Ec-76-1.

PERSONAL COMMUNICATIONS

6. Lindsay, G.D. Environmental Protection Service, Fredericton, N.B.

7. Ternan, G.J. Environmental Protection Service, Dartmouth, N.S.

8. Day, S. Environmental Protection Service, Dartmouth, N.S.

9. Coulter, W. Nova Scotia Department of Environment, Halifax, N.S.

10. Oldreive, C. Nova Scotia Department of Environment, Halifax, N.S.

APPENDIX A

SURVEY FORMS AND RESPONSES

ASSESSMENT OF POTENTIAL COAL-LIQUID MIXTURE FUEL UTILIZATION IN CANADA

DSS CONTRACT 14SQ23440-1-9080
TASK A2.1: UTILITY OIL-FIRED BOILERS

PHASE I: NOVA SCOTIA

Name of Company: Nova Scotia Power Corp.
Postal Address: P.O. Box 910
9th Floor Duke Tower
Halifax, N.S.

Name of Plant: Tuft's Cove
Postal Address:

Please enter data or check as appropriate:

Steam Generator Unit No.		1	2	3	4	5	6
Year of First Commercial Operation		1965	1972	1976			
Design Capacity (lb/hr)		725,000	700,000	1,050,000			
Steam Conditions	Press. (PSIG)	1850	1850	1850			
	Temp. (°F)	1010	1010	1010			
Actual Pounds of Steam Generated in One Year[1]		* 2,624 x 10^6	* 1,756 x 10^6	* 6,268 x 10^6			
Annual Oil-Consumption Rate (Imp. Gals/Yr.)	1980	Total =		93,622,000 gallons			
	1982(Projected)	Total =		66,693,000 gallons			
	Beyond '82 (Proj.)						
Please Specify Type of Oil Used							
Boiler Originally Designed for	Coal - Firing	X					
	Oil - Firing		X	X			
No. of Oil Burners		3	9	9			
Furnace Heat Release Rate (Btu/cu ft./hr)		24,000	29,230	24,780			
Check Appropriate Furnace Bottom Hopper Arrangement	Sloped with Ash Collection	Flat with slag tap					
	Low Slope/Flat Without Ash Collection		sloped	sloped			
If originally designed for oil-firing, was there any design consideration for future coal-firing such as space for pulverizers, coal piping, electrostatic precipitators, etc.			Space for bunkers, pulverizers, ash pit, etc.				
Boiler Manufacturer		B & W	B & W	B & W			
Boiler's Purchase Contract No.							

NOTE 1: A typical figure, representative of figures recorded in recent years is requested.

Comments:

The above information was supplied by:

Name: I.D. Covill Position: Manager, Engineering Telephone: ( )

* Estimated by Monenco

ASSESSMENT OF POTENTIAL COAL-LIQUID MIXTURE FUEL UTILIZATION IN CANADA

DSS CONTRACT 14SQ23440-1-9080
TASK A2.1: UTILITY OIL-FIRED BOILERS

PHASE I: NOVA SCOTIA

Name of Company: Nova Scotia Power Corp.
Postal Address: P.O. Box 910
9th Floor Duke Tower
Halifax, N.S.

Name of Plant: Pt. Tupper
Postal Address:

Please enter data or check as appropriate:

Steam Generator Unit No.		1a	1b	2	3	4	5
Year of First Commercial Operation		1969	1969	1973			
Design Capacity (lb/hr)		600,000	600,000	1,050,000			
Steam Conditions	Press. (PSIG)	2020	2020	1900			
	Temp. (°F)	1030	1030	1005			
Actual Pounds of Steam Generated in One Year[1]		* $3,995 \times 10^6$	* $4,257 \times 10^6$	* $5,031 \times 10^6$			
Annual Oil-Consumption Rate (Imp. Gals/Yr.)	1980	Total =	98,520,000 gallons				
	1982(Projected)	Total =	95,616,000 gallons				
	Beyond '82 (Proj.)						
Please Specify Type of Oil Used							
Boiler Originally Designed for	Coal - Firing	X	X				
	Oil - Firing			X			
No. of Oil Burners		2	9	12			
Furnace Heat Release Rate (Btu/cu ft./hr)		25,600	23,400	25,100			
Check Appropriate Furnace Bottom Hopper Arrangement	Sloped with Ash Collection						
	Low Slope/Flat Without Ash Collection	X	X	X			
If originally designed for oil-firing, was there any design consideration for future coal-firing such as space for pulverizers, coal piping, electrostatic precipitators, etc.		Space for bunkers, ashpit, precip's & Coal feeders	Space for bunkers, & precip's.				
Boiler Manufacturer		B & W	B & W	C.E.			
Boiler's Purchase Contract No.							

NOTE 1: A typical figure, representative of figures recorded in recent years is requested.

Comments:

The above information was supplied by:

Name: I.D. Covill Position: Manager, Engineering Telephone: ( )

* Estimated by Monenco

ASSESSMENT OF POTENTIAL COAL-LIQUID MIXTURE
FUEL UTILIZATION IN CANADA

DSS CONTRACT 14SQ23440-1-9080
TASK A2.2: INDUSTRIAL OIL-FIRED BOILERS

PHASE I: NOVA SCOTIA

Name of Company: N.S. Agricultural College
Postal Address: P.O. Box 550
Truro, N.S.
B2N 5E3

Name of Plant:
Postal Address:

Please enter data or check as appropriate:

Steam Generator Unit No.		1	2	3	4	5	6
Year of First Commercial Operation		1968	1968	1980			
Design Capacity (lb/hr)		20,000	20,000	14,000			
Steam Conditions	Press. PSIG	125	125	125			
	Temp. °F	353	353	353			
Actual Pounds of Steam Generated in One Year[1]		15,781,250	52,560,000*	61,320,000*			
Annual Oil-Consumption Rate (Imp.Gals./yr.)	1980	See Comments Below					
	1982(Projected)	same	same	same			
	Beyond '82 (Projected)						
Please Specify Type of Oil Used		Bunker C	Bunker C	Bunker C			
Estimated Boiler Efficiency (%)		80*	80*	80*			
Boiler's Original Fuel Design and Type	Oil, Watertube						
	Oil, Firetube			X			
	Coal, Stoker	X	X				
	Coal, Pulverized						
	Other, Specify						
Manufacturer's Boiler Type Designation, i.e. Type A, Type O, Type D, etc.		SA	SA				
Boiler Installation	Package	X	X	X			
	Field Erected						
Boiler Manufacturer		FW	FW	Cleaver Brooks			
Boiler's Purchase Contract No.		80-1731-1	80-1731-2				

NOTE 1: A typical figure, representative of figures recorded in recent years is requested.

Comments: An estimate of 257,850 Imp. Gallons (total) has been used in 1981.

The above information was supplied by:

Name: John C. Fitzpatrick Position: Maintenance Manager Telephone: (902) 895-1571

* Estimated by Monenco.

ASSESSMENT OF POTENTIAL COAL-LIQUID MIXTURE
FUEL UTILIZATION IN CANADA

DSS CONTRACT 14SQ23440-1-9080
TASK A2.2: INDUSTRIAL OIL-FIRED BOILERS

PHASE I: NOVA SCOTIA

Name of Company: ESSO Petroleum Canada
Postal Address: P.O. Box 4006, Terminal A
Toronto, Ontario
M5J 1A4

Name of Plant: Dartmouth Refinery
Postal Address: P.O. Box 1001
Dartmouth, N.S.
B2Y 3Z7

Please enter data or check as appropriate:

Steam Generator Unit No.		1	2	3	4	5	6
Year of First Commercial Operation		1956	1956	1956	1960		
Design Capacity (lb/hr)		125,000	125,000	125,000	100,000		
Steam Conditions	Press. PSIG	625	625	625	625		
	Temp. °F	700	700	700	700		
Actual Pounds of Steam Generated in One Year[1]		546 x 10^6 *	577 x 10^6 *	938.4 x 10^6 *	133.9 x 10^6 *		
Annual Oil-Consumption Rate (Imp.Gals./yr.)	1980						
	1982(Projected)						
	Beyond '82 (Projected)						
Please Specify Type of Oil Used		Bunker C	Bunker C	Bunker C	Bunker C		
Estimated Boiler Efficiency (%)		80 *	80 *	80 *			
Boiler's Original Fuel Design and Type	Oil, Watertube				X		
	Oil, Firetube						
	Coal, Stoker						
	Coal, Pulverized						
	Other, Specify	Oil & Gas	Oil & Gas	Oil & Gas	Oil & Gas		
Manufacturer's Boiler Type Designation, i.e. Type A, Type C, Type D, etc.		A	A	Special Design	D		
Boiler Installation	Package				X		
	Field Erected	X	X	X			
Boiler Manufacturer		FW	FW	B & W	B & W		
Boiler's Purchase Contract No.							

NOTE 1: A typical figure, representative of figures recorded in recent years is requested.

Comments: All four boilers operate on a 50% oil & gas ratio.

The above information was supplied by:

Name: G.L. Archambeault Position: Utilities Contact Eng. Telephone: (902) 424-7380

* Estimated by Monenco.

ASSESSMENT OF POTENTIAL COAL-LIQUID MIXTURE
FUEL UTILIZATION IN CANADA

DSS CONTRACT 14SQ23440-1-9080
TASK A2.2: INDUSTRIAL OIL-FIRED BOILERS

PHASE I: NOVA SCOTIA

Name of Company: Dalhousie University
Postal Address: 1236 Henry Street
Halifax, N.S.
B3H 8J5

Name of Plant: Thermal Plant
Postal Address:

Please enter data or check as appropriate:

Steam Generator Unit No.		1	2	3	4	5	6
Year of First Commercial Operation		1971	1971				
Design Capacity (lb/hr)		85,000	85,000				
Steam Conditions	Press. PSIG	125	125				
	Temp. °F	353	353				
Actual Pounds of Steam Generated in One Year[1]		208,490,000	208,490,000				
Annual Oil-Consumption Rate (Imp.Gals./yr.)	1980	1,250,000	1,250,000				
	1982(Projected)	same	same				
	Beyond '82 (Projected)						
Please Specify Type of Oil Used		Bunker C	Bunker C				
Estimated Boiler Efficiency (%)		80*	80*				
Boiler's Original Fuel Design and Type	Oil, Watertube	X	X				
	Oil, Firetube						
	Coal, Stoker						
	Coal, Pulverized						
	Other, Specify						
Manufacturer's Boiler Type Designation, i.e. Type A, Type O, Type D, etc.		D	D				
Boiler Installation	Package	X	X				
	Field Erected						
Boiler Manufacturer		B & W	B & W				
Boiler's Purchase Contract No.							

NOTE 1: A typical figure, representative of figures recorded in recent years is requested.

Comments:

The above information was supplied by:

Name: John W. McMaster Position: Chief Operating Eng. Telephone: (902) 424-2435

* Estimated by Monenco.

ASSESSMENT OF POTENTIAL COAL-LIQUID MIXTURE
FUEL UTILIZATION IN CANADA

DSS CONTRACT 14SQ23440-1-9080
TASK A2.2: INDUSTRIAL OIL-FIRED BOILERS

PHASE I: NOVA SCOTIA

Name of Company: Nova Scotia Forest Industry

Postal Address: P.O. Box 59
Port Hawkesbury, N.S.
B0E 2V0

Name of Plant:

Postal Address: same

Please enter data or check as appropriate:

Steam Generator Unit No.		1	2	3	4	5	6
Year of First Commercial Operation		1961	1961				
Design Capacity (lb/hr)		200,000	300,000				
Steam Conditions	Press. PSIG	880	880				
	Temp. °F	860	860				
Actual Pounds of Steam Generated in One Year[1]		1,244 x 10^6 *	1,498 x 10^6 *				
Annual Oil-Consumption Rate (Imp.Gals./yr.)	1980	6,820,000	8,180,000				
	1982(Projected)	See comments below					
	Beyond '82 (Projected)						
Please Specify Type of Oil Used		Bunker C	Bunker C				
Estimated Boiler Efficiency (%)		80*	80 *				
Boiler's Original Fuel Design and Type	Oil, Watertube	X	X				
	Oil, Firetube						
	Coal, Stoker						
	Coal, Pulverized						
	Other, Specify						
Manufacturer's Boiler Type Designation, i.e. Type A, Type O, Type D, etc.		D	D				
Boiler Installation	Package						
	Field Erected	X	X				
Boiler Manufacturer		B & W	FW				
Boiler's Purchase Contract No.		4939	741				

NOTE 1: A typical figure, representative of figures recorded in recent years is requested.

Comments: The above two boilers are to be replaced by a 500,000 lb/hr unit in near future which will operate on bark. Oil will be used only as supplementary fuel.

The above information was supplied by:

Name: F. Poirier Position: Utilities Superintendent Telephone: (902) 625-2460

* Estimated by Hanenco.

ASSESSMENT OF POTENTIAL COAL-LIQUID MIXTURE
FUEL UTILIZATION IN CANADA

DSS CONTRACT 14SQ23440-1-9080
TASK A2.2: INDUSTRIAL OIL-FIRED BOILERS

PHASE I: NOVA SCOTIA

Name of Company: Michelin Tires (Canada) Ltd.
Postal Address: P.O. Box 399
New Glasgow, Nova Scotia
B2H 5E6

Name of Plant: Granton
Postal Address: same

Please enter data or check as appropriate:

Steam Generator Unit No.		1	2	3	4	5	6
Year of First Commercial Operation				1971			
Design Capacity (lb/hr)				80,000			
Steam Conditions	Press. PSIG			340			
	Temp. °F			432			
Actual Pounds of Steam Generated in One Year[1]				294. x 10^6			
Annual Oil-Consumption Rate (Imp.Gals./yr.)	1980			1,558,140			
	1982(Projected)			same			
	Beyond '82 (Projected)						
Please Specify Type of Oil Used				Bunker C			
Estimated Boiler Efficiency (%)				80*			
Boiler's Original Fuel Design and Type	Oil, Watertube			X			
	Oil, Firetube						
	Coal, Stoker						
	Coal, Pulverized						
	Other, Specify						
Manufacturer's Boiler Type Designation, i.e. Type A, Type O, Type D, etc.				AGM-570			
Boiler Installation	Package			X			
	Field Erected						
Boiler Manufacturer				F.W.			
Boiler's Purchase Contract No.							

NOTE 1: A typical figure, representative of figures recorded in recent years is requested.

Comments: _____

The above information was supplied by:

Name: L. Fisher Position: Energy Manager Telephone: (902) 396-4161

* Estimated by Monenco.

ASSESSMENT OF POTENTIAL COAL-LIQUID MIXTURE
FUEL UTILIZATION IN CANADA

DSS CONTRACT 14SQ23440-1-9080
TASK A2.2: INDUSTRIAL OIL-FIRED BOILERS

PHASE I: NOVA SCOTIA

Name of Company: D.N.D.
Postal Address: C.F.B. Cornwallis
Cornwallis, Nova Scotia
B0S 1H0

Name of Plant: Central Heating Plant
Postal Address:

Please enter data or check as appropriate:

Steam Generator Unit No.		1	2	3	4	5	6
Year of First Commercial Operation		1959	1959	1959			
Design Capacity (lb/hr)		40,000	40,000	40,000			
Steam Conditions	Press. PSIG	135	135	135			
	Temp. °F	360	360	360			
Actual Pounds of Steam Generated in One Year[1]		77,383,700	65,578,500	94,898,000			
Annual Oil-Consumption Rate (Imp.Gals./yr.)	1980	825,450	825,450	5,000			
	1982(Projected)	same	same	same			
	Beyond '82 (Projected)						
Please Specify Type of Oil Used		Bunker C	Bunker C	Bunker C			
Estimated Boiler Efficiency (%)		80*	80*	80*			
Boiler's Original Fuel Design and Type	Oil, Watertube						
	Oil, Firetube						
	Coal, Stoker	X	X	X			
	Coal, Pulverized						
	Other, Specify						
Manufacturer's Boiler Type Designation, i.e. Type A, Type O, Type D, etc.		Integral C	Integral C	Integral C			
Boiler Installation	Package	X	X	X			
	Field Erected						
Boiler Manufacturer		B & W	B & W	B & W			
Boiler's Purchase Contract No.							

NOTE 1: A typical figure, representative of figures recorded in recent years is requested.

Comments:

The above information was supplied by:

Name: B. Bowser Position: Utilities Officer Telephone: (902) 638-8312

* Estimated by Monenco.

ASSESSMENT OF POTENTIAL COAL-LIQUID MIXTURE
FUEL UTILIZATION IN CANADA

DSS CONTRACT 14SQ23440-1-9080
TASK A2.2: INDUSTRIAL OIL-FIRED BOILERS

PHASE I: NOVA SCOTIA

Name of Company: Sydney Steel Corp.

Postal Address: P.O. Box 1450
Sydney, N.S.
B1P 6K5

Name of Plant: _____

Postal Address: _____

Please enter data or check as appropriate:

Steam Generator Unit No.		1	2	3	4	5	6
Year of First Commercial Operation					1961		
Design Capacity (lb/hr)					250,000		
Steam Conditions	Press. PSIG				450		
	Temp. °F				750		
Actual Pounds of Steam Generated in One Year[1]					396.4 x 10^6 *		
Annual Oil-Consumption Rate (Imp.Gals./yr.)	1980				3,037,000		
	1982(Projected)				same		
	Beyond '82 (Projected)						
Please Specify Type of Oil Used					Bunker C		
Estimated Boiler Efficiency (%)					80*		
Boiler's Original Fuel Design and Type	Oil, Watertube				X		
	Oil, Firetube						
	Coal, Stoker						
	Coal, Pulverized						
	Other, Specify						
Manufacturer's Boiler Type Designation, i.e. Type A, Type O, Type D, etc.					2-Drum Sterling		
Boiler Installation	Package						
	Field Erected				X		
Boiler Manufacturer					B & W		
Boiler's Purchase Contract No.							

NOTE 1: A typical figure, representative of figures recorded in recent years is requested.

Comments: _____

_____

The above information was supplied by:

Name: E. E. Dowell Position: Chief Engineer Telephone: (902) 564-5471

* Estimated by Monenco.

ASSESSMENT OF POTENTIAL COAL-LIQUID MIXTURE
FUEL UTILIZATION IN CANADA

DSS CONTRACT 14SQ23440-1-9080
TASK A2.2: INDUSTRIAL OIL-FIRED BOILERS

PHASE I: NOVA SCOTIA

Name of Company: Gulf Oil Company
Postal Address: P.O. Box 2006
Port Hawkesbury, N.S.
DOE 2V0

Name of Plant: _____
Postal Address: _____

Please enter data or check as appropriate:

Steam Generator Unit No.		1	2	3	4	5	6
Year of First Commercial Operation		1969	1973				
Design Capacity (lb/hr)		175,000	100,000				
Steam Conditions	Press. PSIG	600	600				
	Temp. °F	750	750				
Actual Pounds of Steam Generated in One Year[1]		576. x 10^6	64.9 x 10^6				
Annual Oil-Consumption Rate (Imp.Gals./yr.)	1980						
	1982(Projected)						
	Beyond '82 (Projected)						
Please Specify Type of Oil Used		Bunker C	Bunker C				
Estimated Boiler Efficiency (%)		80 *	80 *				
Boiler's Original Fuel Design and Type	Oil, Watertube	X	X				
	Oil, Firetube						
	Coal, Stoker						
	Coal, Pulverized						
	Other, Specify						
Manufacturer's Boiler Type Designation, i.e. Type A, Type O, Type D, etc.		FM	FE-P12-1				
Boiler Installation	Package		X				
	Field Erected	X					
Boiler Manufacturer		FW	Vickers Keeler				
Boiler's Purchase Contract No.							

NOTE 1: A typical figure, representative of figures recorded in recent years is requested.

Comments: _____

The above information was supplied by:

Name: Gordon Brenton Position: Supervisor, Utilities Telephone: (902) 625-1010

* Estimated by Honenco.

ASSESSMENT OF POTENTIAL COAL-LIQUID MIXTURE
FUEL UTILIZATION IN CANADA

DSS CONTRACT 14SQ23440-1-9080
TASK A2.2: INDUSTRIAL OIL-FIRED BOILERS

PHASE I: NOVA SCOTIA

Name of Company: Bowater Mersey Paper Co. Ltd.
Postal Address: Liverpool, N.S.
BOT 1KO

Name of Plant:
Postal Address: same

Please enter data or check as appropriate:

Steam Generator Unit No.		1	2	3	4	5	6
Year of First Commercial Operation					1967	1967	
Design Capacity (lb/hr)					175,000	175,000	
Steam Conditions	Press. PSIG				525	525	
	Temp. °F				660	540	
Actual Pounds of Steam Generated in One Year[1]					744×10^6	496×10^6	
Annual Oil-Consumption Rate (Imp.Gals./yr.)	1980				Total = 6,460,000 gallons		
	1982(Projected)						
	Beyond '82 (Projected)				Total = 5,246,000 gallons		
Please Specify Type of Oil Used					Bunker C	Bunker C	
Estimated Boiler Efficiency (%)					80%*	80*	
Boiler's Original Fuel Design and Type	Oil, Watertube					X	
	Oil, Firetube						
	Coal, Stoker						
	Coal, Pulverized						
	Other, Specify				Oil & Bark		
Manufacturer's Boiler Type Designation, i.e. Type A, Type O, Type D, etc.					2- Drum Sterling	PFI Integral	
Boiler Installation	Package						
	Field Erected				X	X	
Boiler Manufacturer					B & W	B & W	
Boiler's Purchase Contract No.					6370	6365	

NOTE 1: A typical figure, representative of figures recorded in recent years is requested.

Comments: Bowater Mersey have two boilers designated as No. 4 boiler (oil & bark) and No. 5 (oil only). Possibly No. 5 boiler will be a candidate for CLM.

The above information was supplied by:

Name: H.H. Walker Position: Director Special Projects Telephone: (902) 354-3411

* Estimated by Monenco.

ASSESSMENT OF POTENTIAL COAL-LIQUID MIXTURE
FUEL UTILIZATION IN CANADA

DSS CONTRACT 14SQ23440-1-9080
TASK A2.2: INDUSTRIAL OIL-FIRED BOILERS

PHASE I: NOVA SCOTIA

Name of Company: Scott Maritimes

Postal Address: P.O. Box 549 D
New Glasgow, N.S.
B2H 5E8

Name of Plant:

Postal Address: same

Please enter data or check as appropriate:

		1	2	3	4	5	6
Steam Generator Unit No.							
Year of First Commercial Operation		1967					
Design Capacity (lb/hr)		400,000					
Steam Conditions	Press. PSIG	875					
	Temp. °F	900					
Actual Pounds of Steam Generated in One Year[1]		1,310,500,000*					
Annual Oil-Consumption Rate (Imp.Gals./yr.)	1980	6,040,300					
	1982(Projected)	3,750,000					
	Beyond '82 (Projected)	2,500,000					
Please Specify Type of Oil Used		Bunker C					
Estimated Boiler Efficiency (%)		80*					
Boiler's Original Fuel Design and Type	Oil, Watertube						
	Oil, Firetube						
	Coal, Stoker						
	Coal, Pulverized						
	Other, Specify	Bark & Oil					
Manufacturer's Boiler Type Designation, i.e. Type A, Type O, Type D, etc.		Sterling					
Boiler Installation	Package						
	Field Erected	X					
Boiler Manufacturer		B & W					
Boiler's Purchase Contract No.							

NOTE 1: A typical figure, representative of figures recorded in recent years is requested.

Comments: Basically burns bark & purchased log fuel from sawmills supplemented by oil when necessary.

The above information was supplied by:

Name: A. B. Hill Position: Power Superintendent Telephone: (902) 752-8461

* Estimated by Honenco.

ASSESSMENT OF POTENTIAL COAL-LIQUID MIXTURE FUEL UTILIZATION IN CANADA

DSS CONTRACT 14SQ23440-1-9080
TASK A2.2: INDUSTRIAL OIL-FIRED BOILERS

PHASE I: NOVA SCOTIA

Name of Company: Hawker Siddeley
Postal Address: P.O. Box 130
Trenton, Nova Scotia

Name of Plant: Trenton Works
Postal Address:

Please enter data or check as appropriate:

Steam Generator Unit No.		1	2	3	4	5	6
Year of First Commercial Operation		1967	1981				
Design Capacity (lb/hr)		34,000	80,000				
Steam Conditions	Press. PSIG	125	125				
	Temp. °F	548	548				
Actual Pounds of Steam Generated in One Year[1]		52,717,680	108,624,000				
Annual Oil-Consumption Rate (Imp.Gals./yr.)	1980	1,245,650	Not known				
	1982(Projected)	same					
	Beyond '82 (Projected)						
Please Specify Type of Oil Used		Bunker C	Bunker C				
Estimated Boiler Efficiency (%)		80*	80*				
Boiler's Original Fuel Design and Type	Oil, Watertube	X	X				
	Oil, Firetube						
	Coal, Stoker						
	Coal, Pulverized						
	Other, Specify						
Manufacturer's Boiler Type Designation, i.e. Type A, Type O, Type D, etc.		D	D				
Boiler Installation	Package	X	X				
	Field Erected						
Boiler Manufacturer		B & W	B & W				
Boiler's Purchase Contract No.							

NOTE 1: A typical figure, representative of figures recorded in recent years is requested.

Comments:

The above information was supplied by:

Name: David Manuel Position: Plant Eng. - Co-ordinator Telephone: (902) 752-1541

* Estimated by Monenco.

ASSESSMENT OF POTENTIAL COAL-LIQUID MIXTURE
FUEL UTILIZATION IN CANADA

DSS CONTRACT 14SQ23440-1-9080
TASK A2.2: INDUSTRIAL OIL-FIRED BOILERS

PHASE I: NOVA SCOTIA

Name of Company: Dept. of National Defense
Postal Address: Halifax, N.S.

Name of Plant: HMC Dockyard
Postal Address: Building D-62
Halifax, N.S.

Please enter data or check as appropriate:

Steam Generator Unit No.		1	2	3	4	5	6
Year of First Commercial Operation		1949	1949	1949	1971		
Design Capacity (lb/hr)		30,000	30,000	30,000	60,000		
Steam Conditions	Press. PSIG	130	130	130	130		
	Temp. °F	356	356	356	356		
Actual Pounds of Steam Generated in One Year[1]		76.2×10^6*	76.2×10^6*	76.2×10^6*	131.4×10^6*		
Annual Oil-Consumption Rate (Imp.Gals./yr.)	1980	See Comments Below					
	1982(Projected)						
	Beyond '82 (Projected)						
Please Specify Type of Oil Used		Bunker C	Bunker C	Bunker C	Bunker C		
Estimated Boiler Efficiency (%)		80*	80*	80*	80*		
Boiler's Original Fuel Design and Type	Oil, Watertube				X		
	Oil, Firetube						
	Coal, Stoker	X	X	X			
	Coal, Pulverized						
	Other, Specify						
Manufacturer's Boiler Type Designation, i.e. Type A, Type O, Type D, etc.					D		
Boiler Installation	Package	X	X	X	X		
	Field Erected						
Boiler Manufacturer		Vickers Keeler	Vickers Keeler	Vickers Keeler	B & W		
Boiler's Purchase Contract No.							

NOTE 1: A typical figure, representative of figures recorded in recent years is requested.

Comments: The total oil consumption for 1981 was 2,344,360 Imp. Gallons.

The above information was supplied by:

Name: D. Carroll Position: Head, Heating Plant Telephone: (902) 426-4856

* Estimated by Monenco.

ASSESSMENT OF POTENTIAL COAL-LIQUID MIXTURE FUEL UTILIZATION IN CANADA

DSS CONTRACT 14SQ23440-1-9080
TASK A2.2: INDUSTRIAL OIL-FIRED BOILERS

PHASE I: NOVA SCOTIA .

Name of Company: Victoria General Hospital
Postal Address: 1278 Tower Rd.
Halifax, N.S.
B3H 2Y9

Name of Plant: Boiler Plant
Postal Address: same

Please enter data or check as appropriate:

Steam Generator Unit No.		1	2	3	4	5	6
Year of First Commercial Operation		1975	1969	1954	1962		
Design Capacity (lb/hr)		100,000	100,000	50,000	60,000		
Steam Conditions	Press. PSIG	100	100	100	100		
	Temp. °F	387	387	387	387		
Actual Pounds of Steam Generated in One Year[1]		244,238,900	100,610,400	55,475,730	20,330,000		
Annual Oil-Consumption Rate (Imp.Gals./yr.)	1980	Total = 3,100,000 Gallons					
	1982(Projected)	same	same	same	same		
	Beyond '82 (Projected)						
Please Specify Type of Oil Used		Bunker C	Bunker C	Bunker C	Bunker C		
Estimated Boiler Efficiency (%)		80*	80*	80*	80*		
Boiler's Original Fuel Design and Type	Oil, Watertube	X	X				
	Oil, Firetube						
	Coal, Stoker			X	X		
	Coal, Pulverized						
	Other, Specify						
Manufacturer's Boiler Type Designation, i.e. Type A, Type O, Type D, etc.		SA	SA	SA	C		
Boiler Installation	Package	X	X	X	X		
	Field Erected						
Boiler Manufacturer		B & W	FW	FW	B & W		
Boiler's Purchase Contract No.		7218	90-1763-3	SC 1710	5206		

NOTE 1: A typical figure, representative of figures recorded in recent years is requested.

Comments: _____

_____

The above information was supplied by:

Name: R. H. Cuthan Position: Plant Engineer Telephone: (902) 428-2005

* Estimated by Monenco.

ASSESSMENT OF POTENTIAL COAL-LIQUID MIXTURE FUEL UTILIZATION IN CANADA

DSS CONTRACT 14SQ23440-1-9080
TASK A2.2: INDUSTRIAL OIL-FIRED BOILERS

PHASE I: NOVA SCOTIA

Name of Company: Canadian Keyes Fibre Co. Ltd.
Postal Address: 15 Prince Street
Hantsport, Nova Scotia
B0P 1P0

Name of Plant:
Postal Address:

Please enter data or check as appropriate:

Steam Generator Unit No.		1	2	3	4	5	6
Year of First Commercial Operation		1959	1968				
Design Capacity (lb/hr)		50,000	50,000				
Steam Conditions	Press. PSIG	150	150				
	Temp. °F	358	358				
Actual Pounds of Steam Generated in One Year[1]		168,000,000	168,000,000				
Annual Oil-Consumption Rate (Imp.Gals./yr.)	1980	1,087,057	1,087,057				
	1982(Projected)	1,000,000	1,000,000				
	Beyond '82 (Projected)						
Please Specify Type of Oil Used							
Estimated Boiler Efficiency (%)		83%	83%				
Boiler's Original Fuel Design and Type	Oil, Watertube	X	X				
	Oil, Firetube						
	Coal, Stoker						
	Coal, Pulverized						
	Other, Specify						
Manufacturer's Boiler Type Designation, i.e. Type A, Type O, Type D, etc.							
Boiler Installation	Package	X	X				
	Field Erected						
Boiler Manufacturer		Foster Wheeler	Dominion Bridge				
Boiler's Purchase Contract No.							

NOTE 1: A typical figure, representative of figures recorded in recent years is requested.

Comments:

The above information was supplied by:

Name: Mr. Longmire Position: Plant Engineer Telephone: (902)684-3231 Ext. 212

ASSESSMENT OF POTENTIAL COAL-LIQUID MIXTURE
FUEL UTILIZATION IN CANADA

DSS CONTRACT 14SQ23440-1-9080
TASK A2.2: INDUSTRIAL OIL-FIRED BOILERS

PHASE I: NOVA SCOTIA

Name of Company: Avon Valley Greenhouse Ltd.
Postal Address: Town Road
Falmouth, Nova Scotia
B2N 5C1

Name of Plant:
Postal Address:

Please enter data or check as appropriate:

Steam Generator Unit No.		8	2	3	4	5	6
Year of First Commercial Operation		1977				1968	1975
Design Capacity (lb/hr)		20,700				38,000	20,700
Steam Conditions	Press. PSIG	60				100	60
	Temp. °F	Sat				Sat	Sat
Actual Pounds of Steam Generated in One Year[1]		* 42,083,100				* 2,964,000	* 21,632,200
Annual Oil-Consumption Rate (Imp.Gals./yr.)	1980	383,364*				28,752*	208,294*
	1982(Projected)	26,835*				2,000*	14,581*
	Beyond '82 (Projected)	16,638*				1,240*	9,000
Please Specify Type of Oil Used		No. 6				No. 6	No. 6
Estimated Boiler Efficiency (%)		80%				78%	80%
Boiler's Original Fuel Design and Type	Oil, Watertube					X	
	Oil, Firetube	X					X
	Coal, Stoker						
	Coal, Pulverized						
	Other, Specify						
Manufacturer's Boiler Type Designation, i.e. Type A, Type O, Type D, etc.		N/K				N/K	N/K
Boiler Installation	Package	X					X
	Field Erected					X	
Boiler Manufacturer		Cleaver Brooks				F.W.	Hapanee
Boiler's Purchase Contract No.							

NOTE 1: A typical figure, representative of figures recorded in recent years is requested.

Comments: Boiler No. 8 is operated an average of 4,066 hrs/yr, boiler No. 5 is operated 156 hrs/yr, and No. 6, 2,092 hrs/yr. All boilers are generally operated at half of their rated capacity.

The above information was supplied by:

Name: Clary Church Position: Boiler Room Superintendent Telephone: (902)798-8383

ASSESSMENT OF POTENTIAL COAL-LIQUID MIXTURE
FUEL UTILIZATION IN CANADA

DSS CONTRACT 14SQ23440-1-9080
TASK A2.2: INDUSTRIAL OIL-FIRED BOILERS

PHASE I: NOVA SCOTIA

Name of Company: Canadian Salt Co. Ltd.

Postal Address: P.O. Box 160
Pugwash, Nova Scotia
BOK 1L0

Name of Plant:

Postal Address:

Please enter data or check as appropriate:

Steam Generator Unit No.		1	2	3	4	5	6
Year of First Commercial Operation		Information classified as confidential due to Owner's request.					
Design Capacity (lb/hr)							
Steam Conditions	Press. PSIG						
	Temp. °F						
Actual Pounds of Steam Generated in One Year[1]							
Annual Oil-Consumption Rate (Imp.Gals./yr.)	1980						
	1982(Projected)						
	Beyond '82 (Projected)						
Please Specify Type of Oil Used							
Estimated Boiler Efficiency (%)							
Boiler's Original Fuel Design and Type	Oil, Watertube						
	Oil, Firetube						
	Coal, Stoker						
	Coal, Pulverized						
	Other, Specify						
Manufacturer's Boiler Type Designation, i.e. Type A, Type O, Type D, etc.							
Boiler Installation	Package						
	Field Erected						
Boiler Manufacturer							
Boiler's Purchase Contract No.							

NOTE 1: A typical figure, representative of figures recorded in recent years is requested.

Comments: Will be installing an economizer this year.

The above information was supplied by:

Name: Doug Lockhart Position: Plant Supervisor Telephone: (902)243-2511

ASSESSMENT OF POTENTIAL COAL-LIQUID MIXTURE
FUEL UTILIZATION IN CANADA

DSS CONTRACT 14SQ23440-1-9080
TASK A2.2: INDUSTRIAL OIL-FIRED BOILERS

PHASE I: NOVA SCOTIA

Name of Company: CFB Greenwood

Postal Address: B.C.E.O., L.F. CADE
King's County, Nova Scotia
B0P 1N0

Name of Plant: _____

Postal Address: _____

Please enter data or check as appropriate:

Steam Generator Unit No.		2	3	4	1	2	3
Year of First Commercial Operation		1951	1951	1951	1953	1953	1953
Design Capacity (lb/hr)		25,000	25,000	25,000	25,000	25,000	25,000
Steam Conditions	Press. PSIG	125	125	125	125	125	125
	Temp. °F	353	353	353	353	353	353
Actual Pounds of Steam Generated in One Year[1]		40,315,000	40,315,000	40,315,000	29,540,000	29,540,000	29,540,000
Annual Oil-Consumption Rate (Imp.Gals./yr.)	1980	279,755	279,755	279,755	204,414	204,414	204,414
	1982(Projected)	251,780	251,780	251,780	183,973	183,973	183,973
	Beyond '82 (Projected)			NO CHANGE ESTIMATED			
Please Specify Type of Oil Used		No.6	No.6	No.6	No.6	No.6	No.6
Estimated Boiler Efficiency (%)		81%	81%	81%	81%	81%	81%
Boiler's Original Fuel Design and Type	Oil, Watertube						
	Oil, Firetube						
	Coal, Stoker	X	X	X	X	X	X
	Coal, Pulverized						
	Other, Specify						
Manufacturer's Boiler Type Designation, i.e. Type A, Type O, Type D, etc.		N/K	N/K	N/K	N/K	N/K	N/K
Boiler Installation	Package						
	Field Erected	X	X	X	X	X	X
Boiler Manufacturer		Dominion Bridge	Dominion Bridge	Dominion Bridge	Vickers	Vickers	Vickers
Boiler's Purchase Contract No.							

NOTE 1: A typical figure, representative of figures recorded in recent years is requested.

Comments: The first three units are located in plant#1, and are operated year around. Unit no.'s 4, 5 and 6 are located in plant#2 and are operated in winters only.

The above information was supplied by:

Name: Mr. Regan/Mr. Hayes Position: Asst.Chief Eng/Chief Eng. Telephone: (902)765-3391 Ext.511

ASSESSMENT OF POTENTIAL COAL-LIQUID MIXTURE FUEL UTILIZATION IN CANADA

DSS CONTRACT 145Q23440-1-9080
TASK A2.2: INDUSTRIAL OIL-FIRED BOILERS

PHASE I: NOVA SCOTIA

Name of Company: Gordons Greenhouses Ltd.
Postal Address: P.O. Box 70
Oxford, Nova Scotia
BOM 1PO

Name of Plant:
Postal Address:

Please enter data or check as appropriate:

Steam Generator Unit No.		1	2	3	4	5	6
Year of First Commercial Operation		1969	1971				
Design Capacity (lb/hr)		40,000	40,000				
Steam Conditions	Press. PSIG	125	125				
	Temp. °F	353	353				
Actual Pounds of Steam Generated in One Year[1]		1,687,500	1,687,500 (See Comments)				
Annual Oil-Consumption Rate (Imp.Gals./yr.)	1980	550,000	550,000				
	1982(Projected)	Same	Same				
	Beyond '82 (Projected)						
Please Specify Type of Oil Used		No.6	No.6				
Estimated Boiler Efficiency (%)		75%	75%				
Boiler's Original Fuel Design and Type	Oil, Watertube	X	X				
	Oil, Firetube						
	Coal, Stoker						
	Coal, Pulverized						
	Other, Specify						
Manufacturer's Boiler Type Designation, i.e. Type A, Type O, Type D, etc.		D	D				
Boiler Installation	Package	X	X				
	Field Erected						
Boiler Manufacturer		Dominion Bridge	FW				
Boiler's Purchase Contract No.							

NOTE 1: A typical figure, representative of figures recorded in recent years is requested.

Comments: Actual breakdown of generated steam by each boiler is very difficult due to the highly fluctuating nature of demand. The figures presented are only rough estimates for the 3 month/year operation period of the boilers.

The above information was supplied by:

Name: Mr. Gordon Position: President Telephone: (902)447-2810

ASSESSMENT OF POTENTIAL COAL-LIQUID MIXTURE
FUEL UTILIZATION IN CANADA

DSS CONTRACT 14SQ23440-1-9080
TASK A2.2: INDUSTRIAL OIL-FIRED BOILERS

PHASE I: NOVA SCOTIA

Name of Company: Masonite Canada, Ltd.
Postal Address: East River, Lunenburg County
Nova Scotia
B0J 1T0

Name of Plant: Masonite Canada Inc.
Postal Address:

Please enter data or check as appropriate:

Steam Generator Unit No.		1	2	3	4	5	6
Year of First Commercial Operation		1966	1966	1973			
Design Capacity (lb/hr)		30,000	30,000	70,000			
Steam Conditions	Press. PSIG	500	500	500			
	Temp. °F	470	470	470			
Actual Pounds of Steam Generated in One Year[1]		120,000,000*	120,000,000*	390,000,000*			
Annual Oil-Consumption Rate (Imp.Gals./yr.)	1980	1,050,000	1,050,000	2,700,000			
	1982(Projected)	525,000	525,000	1,350,000			
	Beyond '82 (Projected)	DEPENDS ENTIRELY ON STATE OF ECONOMY AND MARKET CONDITIONS					
Please Specify Type of Oil Used		No.6	No.6	No.6			
Estimated Boiler Efficiency (%)		80%	80%	80%			
Boiler's Original Fuel Design and Type	Oil, Watertube	X	X	X			
	Oil, Firetube						
	Coal, Stoker						
	Coal, Pulverized						
	Other, Specify						
Manufacturer's Boiler Type Designation, i.e. Type A, Type O, Type D, etc.		FM D Type	FM D Type	FM D Type			
Boiler Installation	Package	X	X	X			
	Field Erected						
Boiler Manufacturer		B & W	B & W	B & W			
Boiler's Purchase Contract No.							

NOTE 1: A typical figure, representative of figures recorded in recent years is requested.

Comments: Considering market fluctuations, 1980 and 1982 projections are quite accurate.

Note: 3,000,000 gallons of fuel consumed in 1981. (150 lbs. steam/gal. fuel) 7 1/2 months.

The above information was supplied by:

Name: M. Meisner Position: Chief Engineer Telephone: (902)275-3556

* Estimated by Monenco

ASSESSMENT OF POTENTIAL COAL-LIQUID MIXTURE
FUEL UTILIZATION IN CANADA

DSS CONTRACT 14SQ23440-1-9080
TASK A2.2: INDUSTRIAL OIL-FIRED BOILERS

PHASE I: NOVA SCOTIA

Name of Company: Crosselay Karastan Ltd.
Postal Address: 435 Willow Street
Truro, Nova Scotia

Name of Plant:
Postal Address:

Please enter data or check as appropriate:

Steam Generator Unit No.		1	2	3	4	5	6
Year of First Commercial Operation		1970	1970	1974			
Design Capacity (lb/hr)		20,000	20,000	50,000			
Steam Conditions	Press. PSIG	125	125	125			
	Temp, °F	353	353	353			
Actual Pounds of Steam Generated in One Year[1]		18,000,000*	18,000,000*	84,000,000*			
Annual Oil-Consumption Rate (Imp.Gals./yr.)	1980	144,000	144,000	672,000			
	1982(Projected)	187,200	187,200	873,600			
	Beyond '82 (Projected)						
Please Specify Type of Oil Used		No.6	No.6	No.6			
Estimated Boiler Efficiency (%)		85%	85%	85%			
Boiler's Original Fuel Design and Type	Oil, Watertube			X			
	Oil, Firetube	X	X				
	Coal, Stoker						
	Coal, Pulverized						
	Other, Specify						
Manufacturer's Boiler Type Designation, i.e. Type A, Type O, Type D, etc.				D			
Boiler Installation	Package	X	X	X			
	Field Erected						
Boiler Manufacturer		Volcano	Volcano	B & W			
Boiler's Purchase Contract No.							

NOTE 1: A typical figure, representative of figures recorded in recent years is requested.

Comments: It is estimated that 120 MM pounds of steam is generated annually by all three boilers. Of this amount, 84 MM (70% of the total figure) is estimated to have been generated by Unit 3 alone. Units 1 and 2 are assumed to equally generate the remaining portion. The total annual oil consumption is rated at 960 M lbs/yr.

The above information was supplied by:

Name: Bob Quinn Position: Chief Engineer Telephone: (902)895-3491

* Estimated by Monenco

ASSESSMENT OF POTENTIAL COAL-LIQUID MIXTURE FUEL UTILIZATION IN CANADA

DSS CONTRACT 14SQ23440-1-9080
TASK A2.2: INDUSTRIAL OIL-FIRED BOILERS

PHASE I: NOVA SCOTIA

Name of Company: St. Francis Xavier University
Postal Address: Antigonish, Nova Scotia B2J 1C0

Name of Plant:
Postal Address:

Please enter data or check as appropriate:

Steam Generator Unit No.		1	2	3	4	5	6
Year of First Commercial Operation		1965	1965	1955			
Design Capacity (lb/hr)		25,000	25,000	25,000			
Steam Conditions	Press. PSIG	100	100	100			
	Temp. °F	341	341	341			
Actual Pounds of Steam Generated in One Year[1]		41,300,000	41,300,000	41,300,000			
Annual Oil-Consumption Rate (Imp.Gals./yr.)	1980	303,938	303,938	303,938			
	1982(Projected)	400,000	400,000	400,000			
	Beyond '82 (Projected)	Not Known	Not Known	Not Known			
Please Specify Type of Oil Used		No.6	No.6	No.6			
Estimated Boiler Efficiency (%)							
Boiler's Original Fuel Design and Type	Oil, Watertube	X	X				
	Oil, Firetube						
	Coal, Stoker			X			
	Coal, Pulverized						
	Other, Specify						
Manufacturer's Boiler Type Designation, i.e. Type A, Type O, Type D, etc.		AC-124	AC-124	SA			
Boiler Installation	Package	X	X				
	Field Erected			X			
Boiler Manufacturer		FW	FW	FW			
Boiler's Purchase Contract No.		80-1257-1	80-1786-1-2	90-1786-1-2			

NOTE 1: A typical figure, representative of figures recorded in recent years is requested.

Comments:

The above information was supplied by:

Name: Mr. J. MacLean Position: Mechanical Supervisor Telephone: (902)867-2148

ASSESSMENT OF POTENTIAL COAL-LIQUID MIXTURE
FUEL UTILIZATION IN CANADA

DSS CONTRACT 14SQ23440-1-9080
TASK A2.2: INDUSTRIAL OIL-FIRED BOILERS

PHASE I: NOVA SCOTIA

Name of Company: Nova Scotia Hospital
Postal Address: Box 1004
Dartmouth, Nova Scotia
A2Y 3-9

Name of Plant:
Postal Address:

Please enter data or check as appropriate:

Steam Generator Unit No.		1	2	3	4	5	6
Year of First Commercial Operation		1958	1958	1975	1975		
Design Capacity (lb/hr)		25,000	25,000	55,000	55,000		
Steam Conditions	Press. PSIG	125	125	125	125		
	Temp. °F	353	353	353	353		
Actual Pounds of Steam Generated in One Year[1]		Stand by	46,800,000*	80,640,000*	56,300,000*		
Annual Oil-Consumption Rate (Imp.Gals./yr.)	1980	N/K	287,860*	496,000*	346,300*		
	1982(Projected)		Same	Same	Same		
	Beyond '82 (Projected)						
Please Specify Type of Oil Used		No.6	No.6	No.6	No.6		
Estimated Boiler Efficiency (%)							
Boiler's Original Fuel Design and Type	Oil, Watertube			X	X		
	Oil, Firetube						
	Coal, Stoker	X	X				
	Coal, Pulverized						
	Other, Specify						
Manufacturer's Boiler Type Designation, i.e. Type A, Type O, Type D, etc.				N/K	N/K		
Boiler Installation	Package	X	X	X	X		
	Field Erected						
Boiler Manufacturer		Dominion Bridge	Dominion Bridge	Volcano	Volcano		
Boiler's Purchase Contract No.							

NOTE 1: A typical figure, representative of figures recorded in recent years is requested.

Comments: Units 2 and 3 are operated during the winter season while unit 4 is operated during summer. Unit 1 is rated at 25,000 lb/hr of steaming capacity and is used as a stand-by unit. The total steam generation capacity of all four units is about 200 MM pounds/year with total annual oil consumption rate of 1.13 MM gals/year.

The above information was supplied by:

Name: Mr. D. MacIntyre Position: Maintenance Manager Telephone: (902)469-7500

* Estimated by Monenco

ASSESSMENT OF POTENTIAL COAL-LIQUID MIXTURE
FUEL UTILIZATION IN CANADA

DSS CONTRACT 14SQ23440-1-9080
TASK A2.2: INDUSTRIAL OIL-FIRED BOILERS

PHASE I: NOVA SCOTIA

Name of Company: Stanfield's Ltd.

Postal Address: P.O.Box 190
Truro, Nova Scotia
B2N 5C2

Name of Plant: _____

Postal Address: _____

Please enter data or check as appropriate:

Steam Generator Unit No.		1	2	3	4	5	6
Year of First Commercial Operation		1954	1966				
Design Capacity (lb/hr)		24,000	20,000				
Steam Conditions	Press. PSIG	150	150				
	Temp. °F	366	366				
Actual Pounds of Steam Generated in One Year[1]		35,000,000*	29,000,000*				
Annual Oil-Consumption Rate (Imp.Gals./yr.)	1980	273,270*	226,420*				
	1982(Projected)	Same	Same				
	Beyond '82 (Projected)						
Please Specify Type of Oil Used		No.6	No.6				
Estimated Boiler Efficiency (%)		78%	78%				
Boiler's Original Fuel Design and Type	Oil, Watertube	X					
	Oil, Firetube		X				
	Coal, Stoker						
	Coal, Pulverized						
	Other, Specify						
Manufacturer's Boiler Type Designation, i.e. Type A, Type O, Type D, etc.		N/K	N/K				
Boiler Installation	Package	X	X				
	Field Erected						
Boiler Manufacturer		CE	Cleaver Brooks				
Boiler's Purchase Contract No.							

NOTE 1: A typical figure, representative of figures recorded in recent years is requested.

Comments: The company owns an additional boiler rated at 10,000 lb/hr of steaming capacity. The total pounds of steam generated by all three units in one year is estimated at about 78 MM pounds, and the total oil consumption at 609,000 gal/year.

The above information was supplied by:

Name: R.L.Marshal Position: Vice Pres. of Production Telephone: (902)895-5406

* Estimated by Monenco

ASSESSMENT OF POTENTIAL COAL-LIQUID MIXTURE
FUEL UTILIZATION IN CANADA

DSS CONTRACT 14SQ23440-1-9080
TASK A2.2: INDUSTRIAL OIL-FIRED BOILERS

PHASE I: NOVA SCOTIA

Name of Company: Acadia University
Postal Address: Wolfville, Nova Scotia
B0P 1X0

Name of Plant:
Postal Address:

Please enter data or check as appropriate:

Steam Generator Unit No.		1	2	3	4	5	6
Year of First Commercial Operation		1966	1966	1975	1975		
Design Capacity (lb/hr)		25,000	25,000	48,000	48,000		
Steam Conditions	Press. PSIG	110	110	110	110		
	Temp. °F	344	344	344	344		
Actual Pounds of Steam Generated in One Year[1]		17,280,000*	17,280,000*	64,800,000*	64,800,000*		
Annual Oil-Consumption Rate (Imp.Gals./yr.)	1980	133,680*	133,680*	501,320*	501,320*		
	1982(Projected)						
	Beyond '82 (Projected)						
Please Specify Type of Oil Used		No.6	No.6	No.6	No.6		
Estimated Boiler Efficiency (%)		82 - 85%		78 - 82%			
Boiler's Original Fuel Design and Type	Oil, Watertube			X	X		
	Oil, Firetube	X	X				
	Coal, Stoker						
	Coal, Pulverized						
	Other, Specify						
Manufacturer's Boiler Type Designation, i.e. Type A, Type O, Type D, etc.				D	D		
Boiler Installation	Package	X	X	X	X		
	Field Erected						
Boiler Manufacturer		Cleaver Brooks	Cleaver Brooks	Cleaver Brooks	Cleaver Brooks		
Boiler's Purchase Contract No.							

NOTE 1: A typical figure, representative of figures recorded in recent years is requested.

Comments: The total annual steaming capacity is about 160 MM pounds/year. Summer heating demand is met by one small boiler (alternated every month) and the winter demand by one of the larger units (also alternated). The total annual oil consumption rate is given at 1.27 MM per year.

The above information was supplied by:

Name: Mr. Colar Position: Chief Station Engineer Telephone: (902)542-2201

* Estimated by Monenco

ASSESSMENT OF POTENTIAL COAL-LIQUID MIXTURE
FUEL UTILIZATION IN CANADA

DSS CONTRACT 14SQ23440-1-9080
TASK A2.2: INDUSTRIAL OIL-FIRED BOILERS

PHASE I: NOVA SCOTIA

Name of Company: Halifax Infirmary
Postal Address: 1335 Queen Street
Halifax, Nova Scotia
B3J 2H6

Name of Plant: _____
Postal Address: _____

Please enter data or check as appropriate:

		1	2	3	4	5	6
Steam Generator Unit No.							
Year of First Commercial Operation			1967				
Design Capacity (lb/hr)			21,000				
Steam Conditions	Press. PSIG		110				
	Temp, °F		344				
Actual Pounds of Steam Generated in One Year[1]			47,401,000				
Annual Oil-Consumption Rate (Imp.Gals./yr.)	1980		309,313				
	1982(Projected)		278,382				
	Beyond '82 (Projected)						
Please Specify Type of Oil Used			No.6				
Estimated Boiler Efficiency (%)							
Boiler's Original Fuel Design and Type	Oil, Watertube		X				
	Oil, Firetube						
	Coal, Stoker						
	Coal, Pulverized						
	Other, Specify						
Manufacturer's Boiler Type Designation, i.e. Type A, Type O, Type D, etc.			D				
Boiler Installation	Package		X				
	Field Erected						
Boiler Manufacturer			Dominion Bridge				
Boiler's Purchase Contract No.							

NOTE 1: A typical figure, representative of figures recorded in recent years is requested.

Comments: _____

The above information was supplied by:

Name: Derick Russel Position: Chief Engineer Telephone: (902)428-2730

ASSESSMENT OF POTENTIAL COAL-LIQUID MIXTURE
FUEL UTILIZATION IN CANADA

DSS CONTRACT 14SQ23440-1-9080
TASK A2.2: INDUSTRIAL OIL-FIRED BOILERS

PHASE I: NOVA SCOTIA

Name of Company: H.W. Graves and Co. Ltd.

Postal Address: Kentville, Nova Scotia

Name of Plant: _____

Postal Address: _____

Please enter data or check as appropriate:

		1	2	3	4	5	6
Steam Generator Unit No.		1					
Year of First Commercial Operation		1962					
Design Capacity (lb/hr)		20,000					
Steam Conditions	Press. PSIG	125					
	Temp. °F	353					
Actual Pounds of Steam Generated in One Year[1]		63,360,000 (See Cmts.)					
Annual Oil-Consumption Rate (Imp.Gals./yr.)	1980	117,000					
	1982(Projected)	105,300					
	Beyond '82 (Projected)	Same					
Please Specify Type of Oil Used		No.6 or No.5					
Estimated Boiler Efficiency (%)		70% Ave.					
Boiler's Original Fuel Design and Type	Oil, Watertube						
	Oil, Firetube	X					
	Coal, Stoker						
	Coal, Pulverized						
	Other, Specify						
Manufacturer's Boiler Type Designation, i.e. Type A, Type O, Type D, etc.		N/K					
Boiler Installation	Package	X					
	Field Erected						
Boiler Manufacturer		Cleaver Brooks					
Boiler's Purchase Contract No.							

NOTE 1: A typical figure, representative of figures recorded in recent years is requested.

Comments: This boiler is estimated to generate an average of 8,000 lb/hr of steam for 11 mos./yr. The oil consumption rate is taken as 65% of the total plant's consumption rate of 180,000 gal./yr. (1980 rate)

The above information was supplied by:

Name: Mr.B.Crooks Position: Chief Engineer Telephone: (902)678-2101

ASSESSMENT OF POTENTIAL COAL-LIQUID MIXTURE
FUEL UTILIZATION IN CANADA

DSS CONTRACT 14SQ23440-1-9080
TASK A2.2: INDUSTRIAL OIL-FIRED BOILERS

PHASE I: NOVA SCOTIA

Name of Company: Sisters of Charity

Postal Address: Mount St. Vincent
150 Bedford Hwy.
Halifax, Nova Scotia B3M 3J5

Name of Plant:

Postal Address:

Please enter data or check as appropriate:

Steam Generator Unit No.		1	2	3	4	5	6
Year of First Commercial Operation		1958	1958				
Design Capacity (lb/hr)		20,000	20,000				
Steam Conditions	Press. PSIG	110	110				
	Temp. °F	344	344				
Actual Pounds of Steam Generated in One Year[1]		19,740,000	19,740,000				
Annual Oil-Consumption Rate (Imp.Gals./yr.)	1980	377,610	377,610				
	1982(Projected)	Same	Same				
	Beyond '82 (Projected)						
Please Specify Type of Oil Used		Bunker C	Bunker C				
Estimated Boiler Efficiency (%)							
Boiler's Original Fuel Design and Type	Oil, Watertube	X	X				
	Oil, Firetube						
	Coal, Stoker						
	Coal, Pulverized						
	Other, Specify						
Manufacturer's Boiler Type Designation, i.e. Type A, Type O, Type D, etc.		C	C				
Boiler Installation	Package						
	Field Erected	X	X				
Boiler Manufacturer		B & W	B & W				
Boiler's Purchase Contract No.							

NOTE 1: A typical figure, representative of figures recorded in recent years is requested.

Comments: Each boiler is only operated every other winter for six months. Therefore, the figure presented here for each boiler is 1/2 of the total steam production in one year.

The above information was supplied by:

Name: Mr. Johns Position: Chief Engineer Telephone: (902)443-4620

ASSESSMENT OF POTENTIAL COAL-LIQUID MIXTURE
FUEL UTILIZATION IN CANADA

DSS CONTRACT 14SQ23440-1-9080
TASK A2.2: INDUSTRIAL OIL-FIRED BOILERS

PHASE I: NOVA SCOTIA

Name of Company: Maritime Processing
Postal Address: P.O. Box 151
Truro, Nova Scotia
B2N 5C1

Name of Plant:
Postal Address:

Please enter data or check as appropriate:

Steam Generator Unit No.		1	2	3	4	5	6
Year of First Commercial Operation		1978					
Design Capacity (lb/hr)		20,000					
Steam Conditions	Press. PSIG	100					
	Temp. °F	338					
Actual Pounds of Steam Generated in One Year[1]		31,200,000					
Annual Oil-Consumption Rate (Imp.Gals./yr.)	1980	260,000					
	1982(Projected)	Same					
	Beyond '82 (Projected)	Same					
Please Specify Type of Oil Used		No. 6					
Estimated Boiler Efficiency (%)		88%					
Boiler's Original Fuel Design and Type	Oil, Watertube	X					
	Oil, Firetube						
	Coal, Stoker						
	Coal, Pulverized						
	Other, Specify						
Manufacturer's Boiler Type Designation, i.e. Type A, Type O, Type D, etc.		N/K					
Boiler Installation	Package	X					
	Field Erected						
Boiler Manufacturer		Toronto Iron Works					
Boiler's Purchase Contract No.							

NOTE 1: A typical figure, representative of figures recorded in recent years is requested.

Comments:

The above information was supplied by:

Name: Mr. Talbot Position: General Manager Telephone: (902)895-2801

ASSESSMENT OF POTENTIAL COAL-LIQUID MIXTURE
FUEL UTILIZATION IN CANADA

DSS CONTRACT 14SQ23440-1-9080
TASK A2.3: INDUSTRIAL OIL-FIRED PROCESS HEATERS AND COMBUSTORS

PHASE I: NOVA SCOTIA

Name of Company: Scott Maritimes Ltd.

Postal Address: _____

_____

_____

Name of Plant: Scott Maritimes Ltd.

Postal Address: P.O. Box 549 D

New Glasgow, N.S.

B2H 5E8

Please enter data or check as appropriate:

Heater/Combustor Unit No.		1	2	3	4	5	6
Year of First Commercial Operation		1967					
Design Capacity (Btu/hr)		2,641,500					
Actual Amount of Heat (Btu's) Generated in one year[1]		21,061					
Unit's Estimated Efficiency (%)							
Heater/Combustor Manufacturer		Allis Chalmers					
Heater/Combustor Purchase-Contract No.							
Application Process		Lime Kiln					
Annual Oil-Consumption Rate (Imp.Gals./yr.)	1980	3,477,600					
	1982 (Projected)	same					
	Beyond '82 (Projected)						
Please Specify Type of Oil Used							

NOTE 1: A typical figure, representative of figures recorded in recent years is requested.

Comments: _____

_____

The above information was supplied by:

Name: A. B. Hill Position: Power Sup't Telephone: (902) 752-8461

ASSESSMENT OF POTENTIAL COAL-LIQUID MIXTURE
FUEL UTILIZATION IN CANADA

DSS CONTRACT 14SQ23440-1-9080
TASK A2.3: INDUSTRIAL OIL-FIRED PROCESS HEATERS AND COMBUSTORS

PHASE I: NOVA SCOTIA

Name of Company: ESSO Petroleum Canada
Postal Address: P.O. Box 4006
Terminal A
Toronto, Ontario M5J 1A4

Name of Plant: Dartmouth Refinery
Postal Address: P.O. Box 1001
Dartmouth, N.S.
B2Y 3Z7

Please enter data or check as appropriate:

Heater/Combustor Unit No.		1	2	3	4	5	6
Year of First Commercial Operation		1956	1972	1980			
Design Capacity (Btu/hr)		150 MM	67.7 MM	95 MM			
Actual Amount of Heat (Btu's) Generated in one year[1]		919.8 x 10^9 *	533.7 x 10^9 *	582.5 x 10^9 *			
Unit's Estimated Efficiency (%)							
Heater/Combustor Manufacturer		FW & John Zink	Petrochem N.A.O.	Heat Research John Zink			
Heater/Combustor Purchase-Contract No.							
Application Process		Crude Preheat	Crude Preheat	Reduced crude preheat			
Annual Oil-Consumption Rate (Imp.Gals./yr.)	1980						
	1982 (Projected)						
	Beyond '82 (Projected)						
Please Specify Type of Oil Used							

NOTE 1: A typical figure, representative of figures recorded in recent years is requested.

Comments: All three units are basically operated on refinery gas. Less than 20% (average) of the heat is generated by oil.

The above information was supplied by:

Name: P.M. Farely Position: A & V Contact Eng. Telephone: 424-6884

* Estimated by Monenco

APPENDIX B

ESTIMATES OF COAL REQUIREMENTS FOR CLM APPLICATIONS

APPENDIX B

ESTIMATES OF COAL REQUIREMENTS FOR CLM APPLICATIONS

1.0 ESTIMATES OF ANNUAL COAL DEMAND

Estimates of the annual coal demand were made for the two (COM and CWM) conversion cases. These estimates were arrived at using a computer analysis program developed for this purpose.

The annual coal requirements were calculated by boiler and heater categories for each Conversion case. Tables B-1, B-2 and B-3 present heat input rates, oil burn rates, coal burn rates and the estimated annual coal requirements. Table B-4 provides the total estimated coal demand due to CLM conversions. Appendix C provides sample results of the computer anaylsis which provided the input to Tables B-1 and B-2.

1.1 METHODOLOGY

Boilers originally designed for coal firing were assumed to suffer only small losses of up to 15% in their generating capacity when converted to COM or CWM. However, boilers originally designed for oil-firing were assumed to suffer losses as large as 25% to 50% in their steaming capacity when converted to COM or CWM respectively. While no capacity reduction was assumed as a result of the combustor conversion of industrial process heaters, an efficiency loss of 15% for COM conversion and 30% for CWM conversion was used. In cases where large deratings were encountered, a replacement coal-fired boiler was recommended to maintain the rated capacity and make up for the lost generating capacity. The annual coal demand for replacement boilers is included in the estimated annual coal demand. The steaming capacity and the annual coal demand of the replacement boilers were established individually for each Owner. A threshold loss of 20,000 lb/hr of steaming capacity was assumed to justify the installation of a replacement boiler. Losses (from all boilers of one Owner) less than 20,000 lb/hr would not be compensated by replacement boilers.

The heat input rates were calculated based on the given steam conditions and certain assumed boiler inlet water conditions and boiler efficiencies. The assumed conditions are noted under the tables.

The oil burn rate values are based on the actual collected data in the survey. On those occassions were no actual fuel consumption rates were given, estimates were made using the calculated heat input rates.

Using the calorific values of COM and CWM fuels along with the assumed derating percentages and the proper ratios of the coal content in the CLM fuels, the coal burn rates for the converted boilers were estimated. The coal burn rates in the replacement boilers, as mentioned earlier, were calculated separately and added to these estimates. The weighted average of the current capacity factors of each boiler category was used to project the estimated annual coal demand of the converted boilers if their present annual load was to be maintained.

Table B-4 presents the total demand figures for the province.

UTILITY BOILERS

TABLE B-1 - ESTIMATED COAL DEMAND DUE TO CLM CONVERSIONS

Boiler Design	Original Steaming Capacity lb/hr	No. of Units Boilers	Heat Input Rate[1] 1,000 BTU/hr	Oil Burn Rate lb/hr	COM			CWM			Average Capacity Factor	Estimated Annual Coal Demand[5]	
					% Assumed Capacity Loss	New Capacity of Converted Boilers lb/hr	Est. Coal Burn Rate[2] lb/hr	% Assumed Capacity Loss	New Capacity of Converted Boilers lb/hr	Est. Coal Burn Rate[3] lb/hr		COM APPLICATION Short Tons/yr.	CWM APPLICATION Short Tons/yr.
Originally Designed for Coal-Firing	1,925,000	3	2,435,465	149,988	0	1,925,000	93,742	15	1,636,250	217,378	.64	264,325	612,942
Originally Designed for Oil-Firing (Compact Design)	2,800,000	3	3,521,431	183,475	25	2,100,000	86,000	50	1,400,000	156,419	.53	201,063	365,680
Total Estimated Annual Coal Demand for Converted Boilers, ST/yr												465,390	978,620
Total Estimated Annual Coal Demand for Replacement Boilers[4] ST/yr												191,951	479,912
TOTAL DEMAND												657,341	1,458,532

1. Based on following assumptions: Utility boiler efficiency of 88%; boiler inlet water conditions of 400°F and 20 psi higher than the given drum pressure; consumption of No. 6 oil with HHV of 18,500 Btu/lb.

2. Based on following assumptions: 50% COM by weight; Prince Mine Coal with HHV of 11,000 Btu/lb and No. 6 oil with HHV of 18,500 Btu/lb.

3. Based on the assumption of 80% coal, 20% water (by weight) CWM fuel with calorific value (HHV) of 8680 Btu/lb.

4. Assuming a pulverized coal-fired replacement boiler with an efficiency of 85%.

5. The total annual coal requirement for COM or CWM operation takes into account the present capacity factor of boilers.

INDUSTRIAL BOILERS

TABLE B-2 - ESTIMATED COAL DEMAND DUE TO CLM CONVERSIONS

Boiler Design		Original Steaming Capacity (lb/hr)	No. of Units (Boilers)	Heat Input Rate[1] 1,000 BTU/hr	Oil Burn Rate lb/hr	COM			CWM			Average Capacity Factor	Estimated Annual Coal Demand[5]	
						% Assumed Capacity Loss	New Capacity of Converted Boilers lb/hr	Est. Coal Burn Rate[2] lb/hr	% Assumed Capacity Loss	New Capacity of Converted Boilers lb/hr	Est. Coal Burn Rate[4] lb/hr		COM APPLICATION Short Tons / yr.	CWM APPLICATION Short Tons / yr.
Originally Designed for Coal-Firing		560,000	18	686,735	36,870	0	560,000	23,044	15	476,000	53,436	.18	18,609	43,153
Originally Designed for Oil-Firing	Packaged Firetube	185,400	9	225,614	10,347	25	139,050	4,850	50	92,700	8,822	.18	3,764	6,845
	Packaged Watertube	1,565,000	29	1,976,500	229,292	25	1,173,750	107,481	50	782,500	195,480	.24 (Note 6)	114,431	208,120
	Modular & Field Erected	1,053,000	9	1,470,186	73,450	25	789,750	34,430	50	526,500	62,618	.28 (Note 6)	41,678	75,802

1. Based on following assumptions: industrial boiler efficiency of 80%; boiler inlet water conditions of 250°F and 20 psi higher than the given drum pressure; consumption of No. 6 oil with HHV of 18,500 Btu/lb.

2. Based on following assumptions: 50% COM fuel by weight; Prince Mine coal with HHV of 11,100 Btu/lb and No. 6 oil with HHV of 18,500 Btu/lb.

3. Assuming a stoker coal-fired replacement boiler with an efficiency of 76%.

4. Based on the assumption of 80% coal, 20% water (by weight) CWM fuel with HHV of 8680 Btu/lb.

5. The total annual coal requirement for COM or CWM operation takes into account the present capacity factor of boilers.

6. The ESSO Refinery's boilers operate on a typical 50% oil, 50% gas consumption. Therefore, only 50% of the given capacity factor was considered to account for the oil consumption alone.

	COM APPLICATION Short Tons / yr.	CWM APPLICATION Short Tons / yr.
Total Estimated Annual Coal Demand for Converted Boilers	178,482	333,920
Total Estimated Annual Coal Demand for Replacement Boilers[3]	77,952	189,542
TOTAL DEMAND	256,434	523,462

INDUSTRIAL PROCESS HEATERS AND COMBUSTORS

TABLE B-3 - ESTIMATED COAL DEMAND DUE TO CLM CONVERSIONS

Heat/Combustor Design	Heat Input Rate 1,000 BTU/hr	Oil Burn Rate[1] lb/hr	COM		CWM		ESTIMATED ANNUAL COAL DEMAND 4	
			% Assumed Capacity Loss	Est. Coal Burn Rate[2] lb/hr	% Assumed Capacity Loss	Est. Coal Burn Rate[3] lb/hr	COM APPLICATION Short Tons / yr.	CWM APPLICATION Short Tons / yr.
Originally Designed for Oil-Firing	63,825	3,450	0	3,194	0	7,353	12,731	29,308
							40,018*	109,172*
						TOTAL	52,749	138,480

1. Provided by the Owner.

2. 50/50 coal-oil mixture by weight.

3. 80/20 CWM by weight.

4. Using heater's capacity factor of .91.

* Coal requirement equivalent to annual oil consumption for Sydney Corporation's Oil-fired combustors (Metallurgical Furnaces).

TABLE B-4

ESTIMATED COAL DEMAND DUE TO CLM CONVERSIONS IN THE PROVINCE OF NOVA SCOTIA

		Annual Coal Demand in Short Tons	
		COM[1]	CWM[2]
1.	Utility Boilers	657,341	1,458,532
2.	Industrial Boilers	256,434	523,462
3.	Industrial Process Heaters	52,749	138,480
	TOTAL FOR THE PROVINCE	966,524	2,120,474

.1 Assuming that all utility boilers, industrial boilers and industrial process heaters covered in this survey are converted to COM.

.2 Assuming that all utility boilers, industrial boilers and industrial process heaters covered in this survey are converted to CWM.

APPENDIX C

COMPUTER ANALYSIS OF THE COLLECTED DATA

COMPUTER PRINT OUT C-1

This print out lists all boilers according to their design category:

First Category:	Industrial boilers originally designed for coal-firing.
Second Category:	Industiral boilers originally designed for oil-firing; packaged firetube.
Third Category:	Industrial boilers originally designed for oil-firing; packaged watertube.
Fourth Category:	Industrial boilers orginally designed for oil-firing; field erected, watertube.
Fifth Category:	Utility boilers originally designed for coal-firing.
Sixth and Seventh Category:	Utility boilers originally designed for oil-firing; future coal capable and liberal design (no boilers found in these categories).
Eigth Category:	Utility boilers originally designed for oil-firing; compact design.

Figures at the bottom of each category present the following values:

TOTSTM:	Total Steaming Capacity.
THEAT:	Total Heat Input Rate.
TOBR:	Total Oil Burn Rate.
DERAT1:	The New Rating Factor of the COM Converted Boiler (1-% of derating due to conversion).
TNCAP1:	Total New Steaming Capacity of the COM Converted Boilers.
TOTCOM:	Total Coal Burn Rate of COM Converted Boilers.
DERAT2:	The New Rating Factor of the CWM Coverted Boiler (1-% of derating due to conversion).
TNCAP2:	Total New Steaming Capacity of the CWM Converted Boilers.
TOTCWM:	Total Coal Burn Rate of CWM Converted Boilers.
AVECF:	Weighted Average Capacity Factor for the Category.
COMEST:	Annual Coal Demand Estimate for the COM Conversion.
CWMEST:	Annual Coal Demand Estimate for the CWM Conversion.

OWNERS	TOTST* (LB/HR)	THEAT (KBTU/HR)	THWP (LB/HR)	DERAT1	THCAP1 (LB/HR)	TOTCUM (LB/HR)	DERAT2	THCAP2 (LB/HR)	TOTCUM (LB/HR)	AVECF	CONEST (ST/YR)	CUMLST (ST/YR)
MAC.DOCK MAC.DOCK MAC.DUCK CFR.CURNVS CFR.CURNVS CFD.CORNVS VIC.GEN.H. VIC.GEN.H. U.S.AG.COL U.S.AG.COL U.S.HOSPTL ST.FRAN.UN CFD.GRENVD CFD.GRENVD CFD.GRENVD CFD.GRENVD CFD.GRENVD CFD.GRENVD	560000.0	686735.0	36870.4	1.00	560000.0	23044.0	.85	476000.0	53436.5	.18	18609.5	43153.4
AVON.VAL. U.S.AG.COL AVON.VAL. MW.GRAVES ACAD.UNIV. ACAD.UNIV. STANFLD CROSSAV CROSSAV	185400.0	225614.0	10347.8	.75	139050.0	4850.5	.53	92700.0	8821.9	.18	3763.0	6845.3
MAC.DOCK ESSO.PET DALM.UN DALM.UN NICHOLTN GULF.OIL VIC.GEN.H. VIC.GEN.H. HAWKER.SID HAWKER.SID HARIT.PROC HALIF.IMP. ACAD.UNIV. ACAD.UNIV. STANFLD U.S.HOSPTL U.S.HOSPTL ST.FRAN.UN ST.FRAN.UN CROSSAV WASUN.CAN. WARO.CAN. WASUV.CAN. GOPD.GRAN. GOPD.GRAN.												
CAN.SALT. CAN.SALT. CAN.KEY.FB CAN.KEY.FB	1565400.0	1974498.0	229292.9	.75	1173750.0	107481.1	.50	782500.0	195480.1	.24	114431.0	208120.3
AVON.VAL. ESSO.PET ESSO.PET ESSO.PET STCH.STEEL GULF.OIL BOW.MERR. SIBT.OF.CH SIBT.OF.CH	1053000.0	1470186.0	73449.3	.75	789750.0	34429.3	.50	526500.0	62618.0	.20	41678.5	75802.4
TUFTS COVE PT.TUPPER PT.TUPPER	1925000.0	2435465.0	149987.8	1.00	1925000.0	93742.4	.85	1636250.0	217378.6	.64	364325.8	612941.7
TUFTS COVE TUFTS COVE PT.TUPPER	2800000.0	3521431.0	183475.5	.75	2100000.0	86004.1	.50	1400000.0	156419.2	.53	201062.6	365680.7

COMPUTER PRINTOUT C-2

This print out presents the annual coal demands of companies requiring replacement boilers. Those companies with total lost steaming capacities of less than 20,000 lb/hr, are not recommended for installation of replacement boilers.

TLSTM1 = Company's Total Lost Steaming Capacity (due to COM conversion).

RBEST1 = Annual Coal Demand Estimate for Replacment Boilers, Compensating for the COM converted boilers.

AVECF1 = Company's Present Average Capacity Factor.

TLSTM2 = Same as above, only for CWM conversion.

RBEST = Same as above, only for CWM conversion.

AVECF2 = Same as above, only for CWM conversion.

OWNERS	COM TLSTM1 (LB/HR)	COM RREST1 (ST/YR)	COM AVCF1	CWM TLSTM2 (LB/HR)	CWM RREST2 (ST/YR)	CWM AVCF2
ACAD.UNIV.	36500.0	2326.9	.13	73000.0	4653.9	.13
ACAD.UNIV.						
AVON.VAL.	NO REP. BOILER NEEDED FOR COM			39700.0	1917.5	.10
AVON.VAL.						
BOW.MERS.	43750.0	7535.6	.32	87500.0	15071.3	.32
BOW.MERS.						
CAN.KEY.FB	25000.0	4835.7	.38	50000.0	9671.2	.38
CAN.KEY.FB						
CAN.SALT.	NO REP. BOILER NEEDED FOR COM			30000.0	9615.6	.63
CAN.SALT.						
CFB.CORNWS	NO REP. BOILER NEEDED FOR COM			NO REP. BOILER NEEDED FOR CWM		
CFB.CORNWS						
CFB.GRENWD	NO REP. BOILER NEEDED FOR COM			22500.0	1767.9	.15
CFB.GRENWD						
CROSSKN	22500.0	1711.0	.15	45000.0	3421.9	.15
CROSSKN						
DALH.UN	42500.0	6032.7	.28	85000.0	12065.6	.28
DALH.UN						
ESSO.PET	118750.0	18591.0	.27	237500.0	37182.3	.27
ESSO.PET						
GORD.GRNH.	NO REP. BOILER NEEDED FOR COM			40000.0	202.8	.01
GORD.GRNH.						
GULF.OIL	68750.0	11068.9	.27	137500.0	22137.8	.27
GULF.OIL						
HALIF.INF.	NO REP. BOILER NEEDED FOR COM			NO REP. BOILER NEEDED FOR CWM		
HALIF.INF.						
HAWKER.SID	28500.0	2656.3	.17	57000.0	5312.5	.17
HAWKER.SID						
HMC.DOCK	NO REP. BOILER NEEDED FOR COM			43500.0	5791.1	.26
HMC.DOCK						
MARIT.PROC	NO REP. BOILER NEEDED FOR COM			NO REP. BOILER NEEDED FOR CWM		
MARIT.PROC						
MASON.CAN.	32500.0	9291.6	.56	65000.0	18583.0	.56
MASON.CAN.						
MICHELIN	NO REP. BOILER NEEDED FOR COM			40000.0	8590.9	.42
MICHELIN						
NW.GRAVES	NO REP. BOILER NEEDED FOR COM			NO REP. BOILER NEEDED FOR CWM		
NW.GRAVES						
N.S.AG.COL	NO REP. BOILER NEEDED FOR COM			NO REP. BOILER NEEDED FOR CWM		
N.S.AG.COL						
N.S.HOSPTL	27500.0	2021.5	.14	58750.0	4442.1	.15
N.S.HOSPTL						
PT.TUPPER	262500.0	73978.7	.55	723750.0	208768.4	.56
PT.TUPPER						
SIST.OF.CH	NO REP. BOILER NEEDED FOR COM			NO REP. BOILER NEEDED FOR CWM		
SIST.OF.CH						
ST.FRAN.UN	NO REP. BOILER NEEDED FOR COM			28750.0	2759.5	.19
ST.FRAN.UN						
STANFLO	NO REP. BOILER NEEDED FOR COM			22000.0	1901.7	.17
STANFLO						
SYDN.STEEL	62500.0	6822.2	.18	125000.0	13644.4	.18
SYDN.STEEL						
TUFTS COVE	437500.0	117972.6	.52	965000.0	271143.7	.55
TUFTS COVE						
VIC.GEN.H.	50000.0	5058.7	.20	116500.0	10809.8	.18
VIC.GEN.H.						
TOTAL COAL DEM. (IND. & UTIL.)=		269903.3		TOTAL COAL DEM. (IND.&UTIL.)=		669454.3

REQ. NO. 1-9080

CONTRACT REPORT NO. OSQ81-00227

DATA GUIDELINES FOR

ANNEX I: COOPERATION AND PLANNING FOR COAL-LIQUID MIXTURES (CLM) TECHNOLOGY UTILIZATION

29 May 1981

47 pp

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I. INTRODUCTION

The purpose of the data guidelines document is to provide the basis by which a consistent and comprehensive body of data can be collected from multi-national sources for analysis. The guidelines document defines two sets of related data which are required to conduct analyses of Task A: Assessment of Potential CLM Utilization and Task B: Development of an IEA CLM Cooperative Plan.

The guidelines document has been formulated in considerable detail in order to achieve maximum clarity. Member countries should supplement the guidelines data with additional documentation whenever it is believed useful to the objectives of this study.

The data guidelines for Tasks A and B consist of a comprehensive set of requirements covering the following:

Task A

- A.1 FUEL RESOURCES, TRANSPORTATION AND CLM PREPARATION PLANT
- A.2 BOILER AND COMBUSTOR DATA
- A.3 ENVIRONMENTAL DATA
- A.4 INSTITUTIONAL FACTORS
- A.5 FINANCIAL AND COST DATA

Task B

- B.1 TECHNOLOGY ASSESSMENT
- B.2 INPUTS TO CLM COOPERATIVE PLAN

II. GUIDELINES FOR sub TASK A: ASSESSMENT OF POTENTIAL CLM UTILIZATION

A.1 FUEL RESOURCES, TRANSPORTATION AND CLM PREPARATION PLANTS → 4 Months. target.

The major objective of this task is to assess the potential for coal-liquid mixture (CLM) utilization in the participating countries. The data on "Fuel Resources" will be used to evaluate CLM production potential which may be required to meet future CLM demand. The work under "Fuel Resources" should not be a major effort, but is needed to evaluate the CLM supply situation in the participating countries.

1.0 Coal for CLM Applications Use 1985 reference year for CLM. in 1.2

Check all that apply, write explanatory comments and use additional sheet if necessary. NB only CLM not general

1.1 Coal supplies 1981 situation

A. Domestic

B. Imported

C. Domestic and imported

Comments:

1.2 Estimated additional coal requirements for CLM applications:

_____ tons/yr

Comments:

A.1 FUEL RESOURCES, TRANSPORTATION AND CLM PREPARATION PLANTS (Cont'd)

1.3 This increased tonnage can be met by:

A. Increased domestic production

B. Increased imported coal tonnage

C. A and B

Comments:

1.4 Coal characteristics (specify units): CLM.

HHV =

Ultimate/proximate analyses =

Grindability (Hardgrove Index) =

Ash fusion temperatures (initial, softening, fluid) =

Inorganic/organic sulfur (ratio) =

Susceptability to physical beneficiation (comment)

Comments:

General for the importing countries based on their supply specs

Supply countries can be more specific.

1.5 Coal type/mine: CLM

Comments:

1.6 Mining site or port of imported coal, as indicated on a map: CLM

CLM supplied as fuel ?

A.1 FUEL RESOURCES, TRANSPORTATION AND CLM PREPARATION PLANTS (Cont'd)

1.7 Transportation from the mining site or the port of import to the CLM preparation facility:

A. Rail

B. Barge

C. Trucking

D. pipeline

Comments:

1.8 The additional coal traffic will: by 1985

A. Exceed the existing transportation capacity

B. Not exceed the existing transportation capacity

Comments:

1.9 Estimated coal transportation cost (specify units): U$/GJ

A. Rail =

B. Barge =

C. Trucking =

D. Pipeline =

Comments:

1.10 As received coal at the CLM preparation plant:

A. Run-of-the-Mine (ROM)

B. Washed

C. Cleaned; level of cleaning

Comments:

1.11 Estimated cost of as received coal: (1985) U$/GJ

Comments:

2.0 Oil for CLM Applications

Check all that apply, write explanatory comments and use additional sheet if necessary.

2.1 Grade of oil used:

A. No. 6 / Bunker C — state heavist fuel oil spec.

B. Other than No. 6 (specify)

Comments:

2.2 Oil supplies:

A. Domestic; refined from domestic crude

B. Domestic; refined from imported crude (specify country)

C. Imported refined (specify source)

Comments:

A.1 FUEL RESOURCES, TRANSPORTATION AND CLM PREPARATION PLANTS (Cont'd)

2.3 Oil characteristics (specify units): SI metric — Combine with 2.1.

HHV =

Sulfur level = → Worst case / best case / % regional } specify under comments

Vanadium level =

Asphaltene =

Pour point =

Viscosity =

Flash point =

Comments:

2.4 Transportation to the CLM preparation plant:

A. Rail tank car

B. Barge

C. Tank truck

D. Pipeline

Comments:

2.5 Estimated oil transportation cost (specify units):

A. Rail tank car

B. Barge

C. Tank truck

D. Pipeline

Comments:

2.6 Estimated cost of as received oil: V$(1985)

Comments:

3.0 CLM Preparation Plants

Check all that apply, write explanatory comments and use additional sheet if necessary.

3.1 Number of existing CLM preparation plants (on-site, dedicated fuel preparation plants): 1981

COM = Total capacity =

CWM = Total capacity =

Others = Total capacity =

Comments:

3.2 Number of existing CLM preparation plants (centralized fuel preparation plants):

do

COM = Total capacity =

CWM = Total capacity =

Others = Total capacity =

Comments:

A.1 FUEL RESOURCES, TRANSPORTATION AND CLM PREPARATION PLANTS (Cont'd)

3.3 Potential future CLM preparation plants (on site, dedicated fuel preparation plants and centralized fuel preparation plants): 1985

COM = Total capacity = Year of operation = some of this may be

CWM = Total capacity = Year of operation =

Others = Total capacity = Year of operation = can include hist w "Sensitive"

Comments:

3.4 Geographical locations of CLM preparation plants as shown on a map (distinguish existing and planned):

4.0 CLM Transportation ← NB

CLM transportation requirements should be estimated to evaluate whether the existing ~~transportation~~ projected network can handle the increased CLM traffic. The CLM tonnage should be consistent with the coal and oil usages. This exercise is aimed at uncovering impediments which may restrict CLM development. Units should be specified. by 1985

4.1 Barge (waterborne inc barges)

Tonnage =

Cost (actual or estimated) =

Limitation =

A.1 FUEL RESOURCES, TRANSPORTATION AND CLM PREPARATION PLANTS (Concluded)

4.2 Rail

Tonnage =

Cost (actual or estimated) =

Limitation =

4.3 Truck

Tonnage =

Cost (actual or estimated) =

Limitation =

4.4 Pipeline

Tonnage =

Cost (actual or estimated) =

Limitation =

Comments:

A.2 BOILER AND COMBUSTOR DATA

There are hundreds and even thousands of utility and industrial boilers/combustors in each Participating country. It is difficult, almost impossible, to evaluate CLM conversion potential for every boiler/combustor on an individual basis. Therefore, it is proposed that the boiler and combustor data be developed in two parts. The first part consists of statistical data which will be used for CLM market assessment, CLM technology development planning, and policy analysis. The boilers/combustors will be categorized according to the design fuels, utility/industrial applications, boiler size, and age. The second part will develop a sample boiler/combustor data set. Utility/industrial boilers will be categorized into a number of groups according to design differences with regard to boiler configuration, heat release rate and heat transfer tube characteristics. For each group a sectional drawing and boiler design date will be required for evaluation.

NOTE

1.0 Statistical Data

1.1 Utility Boiler Statistical Data

The utility boiler data consists of boilers with capacity equal to or greater than 25 MW(e) (or other minimum capacity which the Participating country will select to represent a low cut-off point for the utility boiler statistical analyses). Combustion turbine and the combined cycle units should not be included.

A.2 BOILER AND COMBUSTOR DATA (Cont'd)

1.1.1 Oil-fired Utility Boiler (originally designed for coal) NOT GAS

A. Total capacity in MW(e)

B. Number of units

C. Age distribution (number and capacity by age)

D. Capacity factor (range and average) See below

E. Geographical distribution, i.e., concentrated, evenly distributed, or scattered (show on a map)

F. Major manufacturers

Comments:

1.1.2 Oil-fired Utility Boiler (originally designed for oil)*

A. Total capacity in MW(e)

B. Number of units

C. Age distribution (number and capacity by age)

D. Capacity factor (range and average) % of year operational on energy basis.

E. Geographical distribution, i.e., concentrated, evenly distributed, or scattered (show on a map) See note.

F. Major manufacturers

Comments:

1.2 Industrial Boiler and Combustor Statistical Data

The industrial boiler (combustor) data consists of boilers (or combustors) with capacity equal to or greater than 10 MW(th) (or Thermal input- 30×10^6 B/h

*Specify oil type (No. 4, No. 6, crude or other).

other minimum capacity which the Participating country may select to represent the lower cut-off point for the industrial boiler statistical data analyses).

1.2.1 Oil-fired Industrial Boiler (originally designed for coal)

A. Total capacity in MW(th)

B. Number of units

C. Age distribution (number and capacity by age)

D. Capacity factor (range and average) not easy in industrial mkt.

E. Geographical distribution, i.e., concentrated, evenly distributed, or scattered (show on a map)

F. Major manufacturers

G. Major industrial users , Type of industry.

Comments:

1.2.2 Oil-fired Industrial Boiler (originally designed for oil)

A. Total capacity in MW(th)

B. Number of units

C. Age distribution (number and capacity by age)

D. Capacity factor (range and average)

E. Geographical distribution, i.e., concentrated, evenly distributed, or scattered (show on a map)

F. Major manufacturers

G. Major industrial users

Comments:

A.2 BOILER AND COMBUSTOR DATA (Cont'd)

1.2.3 Oil-fired Industrial Process Heater (originally designed for oil)

A. Total capacity in MW(th)

B. Number of units

C. Age distribution (number and capacity by age)

D. Capacity factor (range and average)

E. Geographical distribution, i.e., concentrated, evenly distributed, or scattered (show on a map)

F. Major manufacturers

G. Major industrial users

Comments:

1.2.4. ditto but orginally designed for coal —— TARGET

2.0 Sample Boiler (Combustor) Data This to be replaced (see notes)

2 months Utility
4 months Industrial process.

The sample boiler (combustor) data should include the types of boilers (or combustors) which are more easily converted to CLM. The feasibility of boiler (or combustor) conversion to CLM is highly site-specific and design-specific. Nevertheless, it is possible to evaluate the boiler (combustor) design data and to rank boiler types into different groups according to the extent of boiler retrofit. The percentage distribution of boiler types according to (combustor) capacity and population should also be estimated. This data combined with boiler (combustor) age and geographical distribution will permit an estimate of the potential market for CLM.

A.2 BOILER AND COMBUSTOR DATA (Cont'd)

2.1 Sample Utility Boiler Data

2.1.1 Oil-fired Utility Boiler (originally designed for coal)

A. The number of boiler types =

B. The percentage of population for

- type 1 boilers =
- type 2 boilers =

(repeat as necessary)

C. The age distribution of

- type 1 boilers =
- type 2 boilers =

(repeat as necessary)

D. The geographical distribution of

- type 1 boilers =
- type 2 boilers =

(repeat as necessary)

Comments:

A boiler design and operating data form (Item E) should be filled out for each type of boiler. A boiler sectional drawing also should be attached, if possible.

A.2 BOILER AND COMBUSTOR DATA (Cont'd)

E. Boiler design and operating data form

E.1 Name plate data

manufacturer =

year of installation =

E.2 Plant data

coal handling facilities at site =

space for additional boiler =

E.3 Furnace design data

design fuel =

heat release rate (volumetric, EPRS)* =

type of firing =

furnace dimension =

E.4 Burner data

number of burners =

heat input rate per burner =

manufacturer, type =

type of atomization =

atomization medium pressure =

atomization medium temperature =

fuel pressure at burner front =

fuel temperature at burner front =

fuel viscosity at burner front =

*EPRS = effective projected radiant heat absorbing surface.

distance between upper row burner and screen tubes =

distance between lower row burner and hopper =

E.5 Steam data

steam flow rate (max. continuous) =

steam temperature =

steam pressure =

E.6 Tube spacing (center-to-center or clearance)

secondary superheater, front =

secondary superheater, back =

reheater, front =

reheater, back =

economizer =

economizer tube type = finned or bare

E.7 Air heater

type =

E.8 Furnace bottom

hopper bottom or slope bottom =

ash removal system: existing or not existing

E.9 Soot blowers

type =

numbers =

operating frequency =

A.2 BOILER AND COMBUSTOR DATA (Cont'd)

E.10 Flue gas clean-up equipment

cyclone =
efficiency =

electrostatic precipitator =
efficiency =

flue gas desulfurization system =
efficiency =

E.11 Boiler operating data

based load, cyclic load or peak load

annual capacity factor =

annual fuel consumption =

describe or plot an averaged diurnal capacity factor curve

A.2 BOILER AND COMBUSTOR DATA (Cont'd)

2.1.2 Oil-fired Utility Boiler (originally designed for oil)

A. The number of boiler types =

B. The percentage of population for

- type 1 boilers =
- type 2 boilers =

(repeat as necessary)

C. The age distribution of

- type 1 boilers =
- type 2 boilers =

(repeat as necessary)

D. The geographical distribution of

- type 1 boilers =
- type 2 boilers =

(repeat as necessary)

Comments:

A boiler design and operating data form (Item E) should be filled out for each type of boiler. A boiler sectional drawing should also be attached, if possible.

A.2 BOILER AND COMBUSTOR DATA (Cont'd)

E. Boiler design and operating data form

E.1 Name plate data

manufacturer =

year of installation =

E.2 Plant data

coal handling facilities at site =

space for additional boiler =

E.3 Furnace design data

design fuel =

heat release rate (volumetric, EPRS)* =

type of firing =

furnace dimension =

E.4 Burner data

number of burners =

heat input rate per burner =

manufacturer, type =

type of atomization =

atomization medium pressure =

atomization medium temperature =

fuel pressure at burner front =

fuel temperature at burner front =

fuel viscosity at burner front =

*EPRS = effective projected radiant heat absorbing surface.

A.2 BOILER AND COMBUSTOR DATA (Cont'd)

distance between upper row burner and screen tubes =

distance between lower row burner and hopper =

E.5 Steam data

steam flow rate (max. continuous) =

steam temperature =

steam pressure =

E.6 Tube spacing (center-to-center or clearance)

secondary superheater, front =

secondary superheater, back =

reheater, front =

reheater, back =

economizer =

economizer tube type = finned or bare

E.7 Air heater

type =

E.8 Furnace bottom

hopper bottom or slope bottom =

asl. removal system: existing or not existing

E.9 Soot blowers

type =

numbers =

operating frequency =

A.2 BOILER AND COMBUSTOR DATA (Cont'd)

E.10 Flue gas clean-up equipment

cyclone =
efficiency =

electrostatic precipitator =
efficiency =

flue gas desulfurization system =
efficiency =

E.11 Boiler operating data

based load, cyclic load or peak load

annual capacity factor =

annual fuel consumption =

describe or plot an averaged diurnal capacity factor curve

2.2 Sample Industrial Boiler Data

2.2.1 Oil-fired Industrial Boiler (originally designed for coal)

A. The number of boiler types =

B. The percentage of population for

- type 1 boilers =
- type 2 boilers =

(repeat as necessary)

C. The age distribution of

- type 1 boilers =
- type 2 boilers =

(repeat as necessary)

D. The geographical distribution of

- type 1 boilers =
- type 2 boilers =

(repeat as necessary)

Comments:

A boiler design and operating data form (Item E) should be filled out for each type of boiler. A boiler sectional drawing should also be attached, if possible.

A.2 BOILER AND COMBUSTOR DATA (Cont'd)

E. Boiler design and operating data form

E.1 Name plate data

manufacturer =

year of installation =

E.2 Plant data

coal handling facilities at site =

space for additional boiler =

E.3 Furnace design data

design fuel =

heat release rate (volumetric, EPRS)* =

type of firing =

furnace dimension =

E.4 Burner data

number of burners =

heat input rate per burner =

manufacturer, type =

type of atomization =

atomization medium pressure =

atomization medium temperature =

fuel pressure at burner front =

fuel temperature at burner front =

fuel viscosity at burner front =

---

*EPRS = effective projected radiant heat absorbing surface.

A.2 BOILER AND COMBUSTOR DATA (Cont'd)

E.5 Steam data

steam flow data (max. continuous) =

steam temperature =

steam pressure =

E.6 Tube spacing (center-to-center or clearance)

convective pass =

E.7 Air heater

type =

E.8 Furnace bottom

hopper bottom, slope bottom or flat bottom =

ash removal system existent =

E.9 Soot blowers

type =

numbers =

operating frequency =

E.10 Flue gas clean-up equipment

cyclone = yes or no
efficiency =

electrostatic precipitator or baghouse =
efficiency =

A.2 BOILER AND COMBUSTOR DATA (Cont'd)

E.11 Boiler operating data

based load, cyclic load or peak load

annual capacity factor =

annual fuel consumption =

describe or plot an averaged diurnal capacity factor curve =

A.2 BOILER AND COMBUSTOR DATA (Cont'd)

2.2.2 Oil-fired Industrial Boiler (originally designed for oil)

A. The number of boiler types =

B. The percentage of population for

- type 1 boilers =
- type 2 boilers =

(repeat as necessary)

C. The age of distribution of

- type 1 boilers =
- type 2 boilers =

(repeat as necessary)

D. The geographical distribution of

- type 1 boilers =
- type 2 boilers =

(repeat as necessary)

Comments:

A boiler design and operating data form (Item E) should be filled out for each type of boiler. A boiler sectional drawing should also be attached, if possible.

A.2 BOILER AND COMBUSTOR DATA (Cont'd)

E. Boiler design and operating data form

E.1 Name plate data

manufacturer =

year of installation =

E.2 Plant data

coal handling facilities at site =

space for additional boiler =

E.3 Furnace design data

design fuel =

heat release rate (volumetric, EPRS)* =

type of firing =

furnace dimension =

E.4 Burner data

number of burners =

heat input rate per burner =

manufacturer, type =

type of atomization =

atomization medium pressure =

atomization medium temperature =

fuel pressure at burner front =

fuel temperature at burner front =

fuel viscosity at burner front =

*EPRS = effective projected radiant heat absorbing surface.

A.2 BOILER AND COMBUSTOR DATA (Cont'd)

E.5 Steam data

steam flow data (max. continuous) =

steam temperature =

steam pressure =

E.6 Tube spacing (center-to-center or clearance)

convective pass =

E.7 Air heater

type =

E.8 Furnace bottom

hopper bottom, slope bottom or flat bottom =

ash removal system existent =

E.9 Soot blowers

type =

numbers =

operating frequency =

E.10 Flue gas clean-up equipment

cyclone = yes or no
efficiency =

electrostatic precipitator or baghouse =
efficiency =

A.2 BOILER AND COMBUSTOR DATA (Cont'd)

E.11 Boiler operating data

based load, cyclic load or peak load

annual capacity factor =

annual fuel consumption =

describe or plot an averaged diurnal capacity factor curve =

A.2 BOILER AND COMBUSTOR DATA (Cont'd)

2.2.3 Oil-fired Industrial Process Heater (originally designed for oil/gas)

A. Types of process heaters which are more receptive to CLM fuel =

B.1. Applications (general service categories, such as column reboiler, preheater, pyrolysis heater, etc.) =

B.2. Industries which use these process heaters =

C. Age distribution =

D. Geographical distribution =

Comments:

A design and operating data form (Item E) should be filled out for each type of process heater. A section drawing should also be attached, if possible.

A.2 BOILER AND COMBUSTOR DATA (Cont'd)

E. Combustor design and operating data form

E.1 Name plate data

manufacturer =

year of installation =

E.2 Plant data

coal handling facilities at site =

space for additional boiler =

E.3 Furnace design data

design fuel =

heat release rate (volumetric, EPRS)* =

type of firing =

furnace dimension =

E.4 Burner data

number of burners =

heat input rate per burner =

manufacturer, type =

type of atomization =

atomization medium pressure =

atomization medium temperature =

fuel pressure at burner front =

fuel temperature at burner front =

fuel viscosity at burner front =

*EPRS = effective projected radiant heat absorbing surface.

A.2 BOILER AND COMBUSTOR DATA (Concluded)

E.5 Heating fluid data

flow rate (max. continuous) =

temperature =

pressure =

E.6 Air heater

type =

E.7 Furnace bottom

hopper bottom, slope bottom, flat bottom =

ash removal system = existing or not existing

E.8 Soot blowers

type =

numbers =

operating frequency =

E.9 Flue gas clean-up equipment

cyclone =
efficiency =

electrostatic precipitator or baghouse =
efficiency =

E.10 Combustor operation data

based load, cyclic load or peak load

annual capacity factor =

annual fuel consumption =

describe or plot an averaged diurnal capacity factor curve

A.3 ENVIRONMENTAL DATA

The environmental data will be used to evaluate the impact of emissions standards on CLM applications and the associated costs. In particular, discussions on water usage and waste disposal are needed to determine the key factors which may impose restrictions on CLM developments.

1.0 National Regulations on Emissions Standards (specify units)

SO_2 =

NO_x =

Particulates =

Trace elements =

Comments:

2.0 National Regulations on Water Usage

2.1 Impact of Water Usage in CLM Preparation Plants

2.2 Impact of Water Usage in Coal Preparation Plants

Comments:

water availability, effluents, political disposal problems

3.0 National Regulations on Waste Disposal

3.1 Impact of Incremental Waste Disposal from Boilers Firing CLM

3.2 Impact of Waste Disposal from CLM Preparation Plants

3.3 Impact of Waste Disposal from Coal Preparation Plants

, ash from boiler waste from prep plant.

A.3 ENVIRONMENTAL DATA (Concluded)

4.0 Local Regulations on Emissions Standards

The local emissions standards sometimes are stricter than the federal emissions standards. CLM applications may be restricted in particular areas.

Locality =

SO_2 =

NO_x =

Particulates =

Trace elements =

Comments:

5.0 Local Regulations on Water Usage

5.1 Local impact of water usage in CLM preparation plant =

5.2 Local impact of water usage in coal preparation plant =

Comments:

6.0 Local Regulations on Waste Disposal

6.1 Local impact of incremental waste disposal from boiler firing CLM =

6.2 Local impact of waste disposal from CLM preparation plant =

6.3 Local impact of waste disposal from coal preparation plant =

Comments:

A.4 INSTITUTIONAL FACTORS

The fuel price differential between fuel oil and coal is the major economic driving factor in the commercialization of CLM technology. However, governmental actions such as national energy policy, fuel price policy and tax incentives also are influential factors in the development of CLM technology. Therefore, the requested data and information on institutional factors will be required to evaluate the national policy and economic constraints under which CLM technology is being developed.

It is requested that back-up information or publications be supplied. If there is no specified "national energy policy," a summary on governmental actions or policies on coal conversion and/or CLM conversion is acceptable.

1.0 National Energy Policy

Summarize the national energy policy on:

1.1 Oil reduction goals (numerical numbers are desirable but not necessary);

1.2 Coal usage and its projection (list incentive for increased coal production and usage);

1.3 Coal conversion or CLM conversion of boilers/combustors (government mandate, tax incentive, low interest/guaranteed loans, or relaxation of emissions standards).

Comments:

A.4 INSTITUTIONAL FACTORS (Concluded)

2.0 Fuel Price Policy

Summarize the government policy user-taxes on oil and coal:

2.1 Oil user-taxes

2.2 Oil import taxes

2.3 Coal user-taxes

Comments:

3.0 Tax Incentive for CLM Conversion

Summarize the tax incentives for CLM conversions:

3.1 Fast depreciation on equipment

3.2 Tax credits for investment

3.3 Lower tax rates

A.5 FINANCIAL DATA AND COST DATA FOR ECONOMIC ANALYSIS

1.0 Fuel Costs

1.1 Delivered oil cost (1981) =

1.2 Estimated oil costs for 1982-1990 =

1.3 Delivered coal cost (1981) =

1.4 Estimated coal costs for 1982-1990 =

related to inflation rate

use IEA material

Comments:

2.0 Inflation Rate

2.1 Inflation rate (1980) =

2.2 Estimated inflation rate (1981) =

2.3 Estimated inflation rates for 1982-1990 =

Comments:

out. may be sensitive

3.0 Financial Assumptions

3.1 Debt/equity (for utility) =

(for industrial) =

— established.

vary from industry to industry

3.2 Debt rate =

3.3 Equity rate =

3.4 Tax rate for CLM conversion =

3.5 Depreciation method =

3.6 Expected rate of return =

3.7 Expected pay back period =

Comments:

A.5 FINANCIAL DATA AND COST DATA FOR ECONOMIC ANALYSIS (Cont'd)

4.0 Capital Costs

4.1 Capital costs for CLM preparation plant

rough estimates only if not built yet

- Actual costs for CLM preparation plant =
- Throughput of the CLM preparation plant =
- Base year of money =
- Equipment cost =
- Construction cost =
- Land =
- Working capital =
- Fuel inventories cost =

Comments:

4.2 Capital costs for boiler conversion

- Actual costs or estimated costs =
- Retrofitted boiler (combustor) name plate rating =
- Base year of money for conversion =
- Equipment cost =
- Construction cost =
- Working capital (incremental)
- Fuel inventories cost (incremental)

Comments:

A.5 FINANCIAL DATA AND COST DATA FOR ECONOMIC ANALYSIS (Concluded)

5.0 Operation and Maintenance (O&M) Costs

5.1 CLM preparation plant O&M costs (incremental O&M costs if the CLM preparation plant is at the boiler site)

- Actual costs or estimated costs =
- Throughput of the CLM preparation plant =
- Base year of money =
- Fixed O&M costs =
- Variable O&M costs =

5.2 Boiler O&M costs (incremental)

- Actual or estimated costs =
- Retrofitted boiler (combustor) name plate rating =
- Base year of money =
- Fixed O&M costs =
- Variable O&M costs =

6.0 Exchange Rate (reference to U.S. dollars; 1981)

III. GUIDELINES FOR TASK B: DEVELOPMENT OF AN IEA CLM COOPERATIVE PLAN

B.1 TECHNOLOGY ASSESSMENT

Major CLM projects or programs with significant contributions to CLM technology development should be included. For privately funded projects, the project description data and non-proprietary technical data should be completed to the extent possible. Proprietary data should be provided if necessary in accordance with requirements of the Umbrella Agreement. Back-up publications and data for both government and privately funded projects should also be supplied. For each project, complete a project description and technical data sheet.

1.0 Project Description

To provide basis for ATII

Name of company/institution =

Privately funded/government funded =

Funding level and schedule =

Project manager =

Project objectives =

Projection initiation date =

Current status =

Future activities =

Major accomplishments =

Comments:

2.0 Technical Data

A CLM project may address one or more than one technical area listed in the following subsections 2.1 to 2.7. For each technical area being addressed, summarize the technical data and results. The back-up raw data and the relevant publications should also be supplied.

2.1 CLM Preparation Process

- Process Description and Capacity
- Development Status
- Bench Scale/Pilot Scale/Full Scale
- Scale-up Feasibility

2.2 CLM Combustion

- Burner Selection and Performance
- Erosion/Corrosion
- Atomization
- Carbon Burnout
- Boiler Efficiency
- Excess O_2 Level

2.3 Major Equipment (pump, burner, mixer, and others)

- Operational Performance Data
- Special Material
- Erosion/Corrosion
- Costs and Delivery Schedule
- Availability, Maintainability and Reliability

2.4 Instrumentation

- On-Line Instrumentation
- Erosion/Corrosion
- Pumps/Valves Selection and Material
- Costs and Delivery Schedule

2.5 Rheology

- CLM Characteristics (viscosity, stability)
- Additive

2.6 Environmental Controls

- Fly Ash Characteristics
- Gaseous Emissions
- Flue Gas Cleaning Equipment
- Water Usage

2.7 Handling and Transportation

- Pumping and Storage
- Transport (rail, truck, barge)
- Hydraulic Transport

3.0 Coal Beneficiation

Coal beneficiation information should focus on processes which can be integrated into the CLM preparation system. However, coal beneficiation generally is important to CLM technology development. Therefore, a brief summary of the current status of the coal

beneficiation program, particularly in the deep cleaning of fine coals, will be useful. The objective is to examine coal beneficiation technology development for low ash and low sulfur fine coals which may be used in CLMs.

3.1 Coal cleaning processes which have been used together with CLM preparation processes

3.1.1 Process descriptions

3.1.2 Sulfur and ash removal percentages for selected coals

3.1.3 Commercial status or target commercial date

3.2 Coal cleaning processes which could produce coals to meet CLM requirements

3.2.1 Process descriptions

3.2.2 Sulfur and ash removal percentages for selected coals

3.2.3 Commercial status or target commercial date

Comments:

B.2 INPUTS TO CLM COOPERATIVE PLAN

Inputs to a CLM cooperative plan are requested from each participating country. The inputs received will be integrated into a common base from which a CLM cooperative plan will be developed. The plan will aim at identifying overlapping projects and program gaps. Recommendations for cooperation of multi-national projects will be made if considered practical. Likewise, new projects will be recommended to cover the existing technology gaps.

1.0 National Program Plan on CLM

1.1 The Government Agency in Charge of National CLM Program

1.2 Summarize the CLM Program Objectives

1.3 The Role of Government in the CLM Program

1.3.1 Directly Funded R/D Projects

1.3.2 Cost-shared Demonstration Projects

1.3.3 Others

Comments:

1.4 Summarize Other Related Coal Technology Development Plans

Comments:

2.0 Cooperative Research Planning

2.1 Viewpoint of Participant on R/D Needs in CLM Technology (National Basis)

Complete the following table and comment if necessary.

B.2 INPUTS TO CLM COOPERATIVE PLAN (Concluded)

	More R/D is Planned	On-Going R/D is adequate	Commercial Status has been achieved
CLM Preparation Process			
CLM Combustion			
Major Equipment			
Instrumentation			
Rheology			
Environmental Controls			
Handling and Transportation			

2.2 Proposed Cooperative Research Needs as Viewed by the Participant

2.2.1 Proposed Technical Areas (description)

2.2.2 Specific Details on Cooperation

- information/data exchange
- jointly funded R/D projects
- others

Comments:

2.2.3 Proposed Organization Mechanism

- IEA
- others

Comments: